

# ENDANGERED *Species* BULLETIN

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*Wildlife, it is said, knows no borders, and this is especially true for migratory birds. Many species travel great distances each year and face a variety of threats along the way. Some, like the whooping crane or Aleutian Canada goose, declined to the point that Endangered Species Act protection was necessary to prevent their extinction. After a great deal of hard work, these and other birds are on the road to recovery. But a more effective means of bird conservation is to **prevent** problems by maintaining healthy populations of associated species in secure habitats. The Fish and Wildlife Service, along with its many partners at the Federal, international, State, and local levels, is increasingly taking such an ecosystem approach.*



Photo by Richard Fear/National Park Service

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**On the Cover**

Wildlife biologists hope that the future of migratory species like the prothonotary warbler (left) can be assured before these birds need Endangered Species Act protection.

*Photo by Dan Petit*

**Opposite page**

Florida Everglades



*The Endangered Species Bulletin welcomes manuscripts on a wide range of topics related to endangered species. We are particularly interested in news about recovery, habitat conservation plans, and cooperative ventures. Please contact the Editor before preparing a manuscript. We cannot guarantee publication.*

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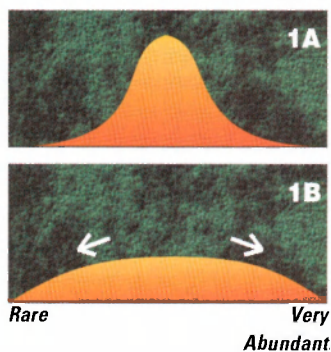
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by Paul R. Schmidt and  
Daniel R. Petit

# Bird Conservation: More than Just Chasing the Tails●



**Figure 1 suggests the changing trends that are reshaping the “bird environment” over time. (a) The natural bird environment: most species are fairly common, a few are very rare or very abundant. This is the natural state of bird populations. (b) More recently, however, ecosystems have become more degraded or altered, and those changes have caused a reshaping of the bird environment: more species are sliding from the peak of the distribution to the tails (arrows) and becoming very rare (e.g., endangered species) or superabundant (e.g., snow geese). The change in the bird environment in recent years has resulted in severe consequences not only for these birds themselves, but also for other species.**

*E*ach generation of bird conservation has built upon the successes, and tried to correct the shortcomings, of its predecessors. The current generation, too, is looking to the past to help shape its future. With exponential rises in human populations and the resulting global environmental impacts, our task seems to dwarf those of our predecessors. However, the stakes—the existence of thousands of temperate and tropical bird species—remain the same.

## The Shape of the Natural Bird Environment

As anyone who watches birds knows, some species are rare, some are fairly common, and some can be found on almost any trip to the field. These differences in species' abundances occur naturally. If one were to plot these natural abundance patterns on a graph, with relative abundance on the horizontal axis and the number of species on the vertical axis, it would look similar to the classic bell-shaped curve (Figure 1a). The top of the curve represents the vast majority of species, birds that are of average abundance. As one proceeds outward on the curve from the peak, species become either far more (to the right) or far less (to the left) abundant. In a natural, balanced environment, a small set of species occupy these “tails” of the distribution. Natural processes, like weather, predation, disease, and food and habitat availability, have shaped these patterns of species abundance for millennia. In recent years, however, human activities have disrupted many of those natural processes, resulting in a change in the “shape” of the bird environment.

## What is happening to bird habitat?

The past few decades have been witness to dramatic changes in the quality and quantity of bird habitat. Throughout the Western Hemisphere, wetlands continue to be drained and filled, forests cut and fragmented, and grasslands paved over. Many of these changes are not what they appear. For example, while forest cover in some areas has actually increased, the *quality* of those habitats compared to the original forests may not be similar at all because of changes in vegetation composition and artificially abundant predator populations.

Other seemingly less obtrusive land use practices have upset the natural balance as well. For example, waste grain left in fields in the southern United States has increased overwinter survival of some species of geese. While this can dramatically increase the survival of overwintering individuals, sometimes it means that many more birds fly north in the spring than can be supported by the breeding habitat at the other end of their migration route. The result in one case has been severe damage to the tundra ecosystem around Hudson Bay. One



thing is certain: while bird habitats have been changing rapidly during the 20th century, our approach to wild bird conservation has not evolved at a pace necessary to prevent the occurrence of many serious problems.

### Chasing the Tails

Recent years have seen an increasingly skewed pattern of avian abundance. The traditional approaches to bird conservation have not been inclusive enough to prevent this reshaping of the bird environment. Management agencies and conservation organizations have chased the tails of the distribution—both rare or declining species and overabundant species—and largely assumed that the vast majority of species occupying the middle ground would “take care” of themselves.

Traditional bird conservation efforts have not prevented the slide of more and more species from the peak of the curve to the tails. After more than a century of rapid environmental degradation (especially habitat loss and fragmentation), without *proactive* conservation measures in place, the bell-shaped curve has flattened for birds (Figure 1b). With this change has come a massive, expensive, and *reactive* workload for bird conservationists.

### The Left Tail: Storks, Sparrows, Warblers, and Woodpeckers

The Endangered Species Act of 1973 provided a significant safeguard in which species sliding down the left side of the curve (i.e., less abundant) are kept from the grasp of extinction. The wood stork (*Mycteria americana*), golden-cheeked warbler (*Dendroica chrysoparia*), red-cockaded woodpecker (*Picoides borealis*), and many other species of migratory birds owe their current existence in the United States to the determined, last-ditch efforts carried out under this legislative milestone. But attempting to pull species back from the brink of extinction can be an expensive and contentious proposition.



Even today, despite considerable conservation gains in the past few years, many challenges still threaten to drive species down the left side of the curve, away from healthy populations, and onto the endangered species list.

### The Right Tail: Cormorants, Cowbirds, Crows, and Geese

Just the opposite phenomenon occurs on the right tail of the curve. Here, birds that thrive in highly altered or artificial environments propagate to the point that they exceed their natural carrying

***Increased tree cover is not enough for some forest bird species, which need large, unfragmented habitat with a natural vegetation composition.***

*Photo by Dan Petit*





**Forest fragmentation has led to widespread increases in the abundance and distribution of brown-headed cowbirds (*Molothrus ater*). Cowbirds are "brood parasites" that lay their eggs in the nest of a "host" species, relying upon the host to raise their young. Here, three different cowbirds have laid eggs in the nest of a hooded warbler (*Wilsonia citrina*), a neotropical migrant. Under these conditions, the host warblers will rarely be able to raise their own young birds.**

Photo by Kenneth Petit, Smithsonian Migratory Bird Center



**Brood parasitism by brown-headed cowbirds, along with habitat loss and unusually high predation rates, are the most likely reasons for the declines of painted buntings (*Passerina ciris*), above, and other neotropical migratory birds. Unusually high populations of nest predators and parasites have overrun many areas of eastern United States, adding to population losses of more than 100 species of migratory birds.**

Photo by Alan Williams, Smithsonian Migratory Bird Center

capacity, and thus impose significant economic losses on local human communities, inflict severe damage to natural habitats, and cause unnatural population crashes in other species. If you've visited a golf course in the east lately, you've probably seen one of the problems. Some populations of Canada geese (*Branta canadensis*), whose natural migratory habits have disappeared in the past few decades, now remain year-round on their once southern wintering grounds. Open, grassy, artificial habitats and abundant food—lawn grasses and bread from park visitors, for example—provide the geese with no incentive to leave these areas for more northerly climes during the breeding season.

Superabundant and artificial sources of winter food (e.g., aquaculture, grains), which created winter habitat that maintains more birds than the corresponding breeding habitat can support, has increased overwinter survival of double-crested cormorants (*Phalacrocorax auritus*) and snow geese (*Chen caerulescens*) to the point that these species have become significant problems in many areas.

Songbirds are not exempt from these habitat management problems. Brown-headed cowbirds (*Molothrus ater*) and American crows (*Corvus brachyrhynchos*) have exploded in numbers with the opening of eastern forests. Now, in many forested habitats, crows represent the most significant predator of songbird eggs and nestlings. Brown-headed cowbirds, once restricted to the Great Plains, can be found in nearly every State and province of North America and now parasitize more than 200 species of birds. It is clear that formerly natural systems have been altered and now foster overabundant, problematic species that are on the rise.

#### **A Vicious Circle: When the Tails Meet**

One of the most distressing scenarios occurs when the right tail meets the left. For example, after gaining access to the highly fragmented habitats of both

Kirtland's and golden-cheeked warblers, the overabundant cowbirds have propelled these endangered species even closer to extinction. Mass destruction of tundra and other wetlands along Hudson Bay—a by-product of the exponential growth of snow goose populations in the 1980's and 1990's—is threatening the phalarope, shorebird, and songbird populations in that region. The European starling (*Sturnus vulgaris*), an introduced species, displaces native woodpeckers, flycatchers, bluebirds, and other cavity-nesting species. Expanding double-crested cormorant populations have overtaken night-heron rookeries along the Great Lakes, and that situation is only likely to get worse. Even overbrowsing of vegetation by white-tailed deer, one of the principal species for which many wildlife agencies create habitat—highly *fragmented* habitat—can significantly impact shrub-nesting songbirds and other wildlife that depend upon forest understory. All of these increasingly abundant species drive other bird species towards the left-hand tail of the abundance curve and towards extirpation.

#### **The Need to Also Manage for the Middle**

Reacting to the status of species at the tails of the distribution is the traditional approach of natural resources agencies and organizations, but it creates a situation where one is always left in a "chasing" mode. Always playing catch-up is not an effective approach to bird conservation. Clearly, a new paradigm for conserving all wild birds—one that includes those species in the middle of the distribution—is sorely needed.

Fortunately, some science-based conservation initiatives do exist, and can serve as models. Principles of conservation biology serve as the foundation for these approaches. For example, whenever possible: (1) management actions should address the needs of *entire species suites or communities* through conservation or restoration of intact, natural ecosystems; (2) local manage-



ment objectives and priorities should directly contribute to conservation objectives and priorities at *larger, regional levels*; and (3) conservation plans should attempt to *integrate the social and economic, as well as biological, concerns of stakeholders*. Representative James Scheuer, retired Chairman of the Subcommittee on the Environment, U.S. House of Representatives, summed it up best: "We need to become proactive and holistic in our policies and move towards an integrated, multi-species and ecosystem approach to land use and conservation. The issue isn't endangered species, but endangered ecosystems. Our goal should become the management of ecosystems for the sustainable use of biological resources and the conservation of biodiversity" (Conservation Biology 7:206-207, 1993).

The above strategy would ensure that regardless of where a species falls on the abundance curve—at the tails or somewhere in-between—it would stand a good chance of continued survival. To accomplish this goal, biologically based plans that include clearly articulated conservation priorities must be developed and supported by land management agencies, conservation organizations, private landowners, and the public in general. The soon-to-be-completed conservation plans of Partners in Flight and the vision laid out in the 1998 "Update of the North American Waterfowl Management Plan" are two examples of proactive road maps that will lead to more effective bird conservation in the 21st century. While the future conservation of wild birds is certain to contain some steep and rugged topography, a holistic, ecosystem-based approach will guarantee that at least we have covered all the species in both the valleys *and* the peak.

*Paul R. Schmidt is Chief of the FWS Office of Migratory Bird Management. Daniel R. Petit is a Wildlife Biologist in the Office of Migratory Bird Management and National Coordinator of Partners in Flight for the FWS.*



**An overabundance of snow geese (above) has damaged the nesting habitat of birds such as the stilt sandpiper (*Calidris himantopus*).**  
Photo by Diane Menke/USFWS



**Stilt sandpiper**  
Photo by Lauraine Armstrong

by Robert P. Ford

# Bird Conservation in America's Heartland



**Yellow-billed cuckoo**

Illustration by Louis Agassiz Fierstes

**E**ver hear of the Interior Low Plateau Region? If not, you may be surprised that it covers over 30 million acres (12.1 million hectares), spread across a wide swath of the south-central United States from southern Illinois, Indiana and Ohio, through Kentucky and Tennessee, and into northern Alabama. It is a haven for hundreds of species of wild birds and a region of progressive bird conservation activities.

The marked diversity of habitats in the Interior Low Plateau reflect a long and varied history of climatic and geological influences. Grassland and oak savanna communities characteristic of the Great Plains are found here. Extensive western mesophytic (oak-hickory) forests and forested wetlands also occur throughout the region. The rare barren and glade habitat types—recognized as communities of global ecological importance—are scattered in pockets among the taller, dominant forests. Geographers have done their part by coining colorful names for the corresponding physiographic subdivisions: the Bluegrass and Pennyroyal Regions of Kentucky, the Western Highland Rim of Tennessee, and the Tennessee Valley of northern Alabama.

This is a place where rich American folklore originated. It's also a place where new ways of approaching bird conservation are springing to life. While few threatened or endangered bird species occur within the Interior Low Plateau, many bird species in many different habitats within this region are experiencing long-term declines.

For example, the cerulean warbler (*Dendroica cerulea*), considered a common species throughout the region only 30 years ago, is now uncommon in

some parts and rare in many others. Cerulean warblers occur in large tracts of mature hardwoods during the summer and in the Peruvian montane forests of South America during the winter. Why it is declining at rates exceeding 3 percent per year is not known for sure, but other species that share its breeding habitat, like the wood thrush (*Hylocichla mustelina*), yellow-billed cuckoo (*Coccyzus americanus*), and Louisiana waterthrush (*Seiurus motacilla*), are declining as well.

Bewick's wren (*Thryomanes bewickii*), still fairly common in the western United States, has almost disappeared from the East. This wren's favorite haunts include slash piles in forest industry clearcuts, areas of natural disturbance, rural areas, and old farms. It, too, is not alone in its population decline: the Bachman's sparrow (*Aimophila aestivalis*), northern bobwhite (*Colinus virginianus*), and field sparrow (*Spizella pusilla*) also are disappearing from rural landscapes.

The Henslow's sparrow (*Ammodramus henslowii*) occurs in large grasslands, and although it is expanding its range in the Interior Low Plateau Region, overall population numbers are very low. The grassland-dwelling dickcissel (*Spiza americana*) and grasshopper sparrow (*Ammodramus savannarum*) are declining, too. Although no species are entirely dependent on barrens and glade habitats, two declining species, the prairie and blue-winged warbler (*Dendroica discolor* and *Vermivora pinus*, respectively), are regularly found there.

How have we responded to these declines? Under the umbrella of the Partners in Flight program, diverse, and



some historically unusual, partnerships have formed to halt and reverse declining populations through better habitat management and research. A team comprised of the forest products industry (Westvaco Corporation, Champion International, Willamette Industries), State fish and wildlife agencies, U.S. Fish and Wildlife Service, Tennessee Valley Authority, Tennessee Conservation League, The Nature Conservancy, and numerous other businesses, universities, and private landowners are bringing their collective resources to bear on these populations and habitats.

A Partners in Flight Bird Conservation Plan has been drafted for the Interior Low Plateau Region. This novel plan promotes landscape-level habitat conservation and management that encourages not only biological sustainability, but economic sustainability as well. Scientific research plays a major role in this plan. For example, analysis of Breeding Bird Atlas data has provided locations of important areas for entire suites of species, such as cerulean warblers and wood thrush, that depend upon mature hardwoods. Current field work is building upon those data to determine which of these areas have the best chance of sustaining these populations. Combining solid scientific information with open communication among partners is proving to be a strong force for future management of critically important habitats. Traditional adversaries are now working together for common goals.

The forest products industry has been an important partner in sustaining mature hardwoods within a managed forested landscape. Industry is now considering ways to improve habitat conditions on clearcuts to provide habitat for Bewick's wren and Bachman's sparrow. In grassland habitats, Partners in Flight objectives have been linked with State agency small game objectives for warm season grass restoration and management. All of the animals benefit. Finally, in barrens and glade habitats, bird population



**Dickissel**

*Photo by Steve Maslowski/USFWS*

objectives established by Partners in Flight are closely tied to experimental management efforts that are aimed at restoring the natural features of these barrens. As research determines bird responses to different restoration techniques, further population and management objectives will be set across the Interior Low Plateau.

Many management questions remain in the region. For example, how much acreage in mature forest do cerulean warblers need to maintain healthy populations? How does the nesting productivity of Bewick's wren and Bachman's sparrow in clearcuts compare to productivity in more stable early-succession habitats, such as barrens and glades? How large do grasslands need to be in the Interior Low Plateau in order to sustain Henslow's sparrow populations? These are all critical parts of the conservation puzzle yet to be solved.

Conservation and management of wild birds within the Interior Low Plateau will move forward with advances in research and monitoring. This strategy is in step with the progressive new way of thinking in this otherwise traditional region.

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by Roxanne E. Bogart

# Conserving the Migratory Birds of Mexico's Wetland Ecosystems



**Snail kite**  
USFWS photo

Step southward across the U.S.-Mexico border and you have entered one of the world's most biologically diverse countries. Mexico's complex topography and climate have spawned a multitude of habitats, such as lush tropical forests in Chiapas and the Yucatan, extensive mangroves and coastal lagoons along the Sea of Cortez, and expansive desert scrub and grasslands in Sonora and Chihuahua. In fact, Mexico ranks fourth among nations with high centers of plant diversity.

The nation's bird diversity reflects this great habitat diversity. Mexico supports 1,060 species of birds, or about 11 percent of the world's bird species—more than the U.S. and Canada combined. Mexico ranks fifth in the world for greatest number of endemic bird areas, with 10 percent of the country's bird species found nowhere else in the world. Due to its habitat diversity and strategic positioning at the nearctic and neotropical biogeographic boundary, Mexico holds significant conservation value for migratory birds. Nearly 95 percent of the more than 300 bird species that migrate south out of Canada and the United States use Mexico's ecosystems to overwinter or refuel during long journeys to other parts of Latin America.

natural diversity. Waterfowl, shorebirds, colonial waterbirds, and hundreds of species of landbirds depend upon these bountiful habitats. Mexico's wetland resources also provide services that sustain the quality of life for people. Wetlands control floods and erosion, recharge ground water, filter contaminants, and provide a buffer to hurricanes. Many wetland ecosystems produce impressive quantities of oysters, shrimp, fish, and other valuable resources. Nevertheless, as in the United States and Canada, Mexico's wetlands have been seriously impacted by agriculture and urban development, petroleum production, and overexploitation of resources. Sixty-five percent of Mexico's mangroves, for example, have been deforested.

## The Importance of Mexico's Wetlands

From coastal mangroves and lagoons to inland swamps and marshes to desert lakes and springs, Mexico's wetland ecosystems exemplify the country's

## A Partnership Approach

In 1989, to reverse more than a century of wetland habitat loss throughout North America, the U.S. Congress passed the North American Wetlands



Conservation Act. This law created a grants program that encourages organizations and individuals to work jointly for conserving wetland ecosystems for migratory birds and other wildlife. To date, more than \$5.5 million (U.S.) in grants under the Act have supported 67 projects and the work of numerous Mexican and U.S. partner organizations, which also have contributed more than \$7.5 million (U.S.) in matching funds to conserve these critical habitats.

The Act represents an important tool for recovering Mexico's endangered species, including those that spend part of the year north of the border, and for protecting bird species before severe population declines necessitate recovery efforts. Projects typically occur within one of Mexico's 32 priority wetland areas, many of which are considered especially important for bird conservation due to the uniqueness, abundance, and/or conservation status of birds that use the sites. Thirty-seven percent of Mexico's bird species, including more than half of the nation's endemics, currently are listed by Mexico as in danger, threatened, vulnerable, or rare.

Other funds provided under the Act helped the State of Tabasco establish three community nurseries for the propagation and production of forest and fruit-trees in order to reduce harvest pressure on mangroves and other natural resources in the Centla Marshes Biosphere Reserve. The Reserve provides habitat for more than 100 bird species, including the rare Muscovy duck (*Cairna moschata*) and snail kite (*Rostrhamus sociabilis*), and the endangered wood stork (*Mycteria americana*). Funds also supported an educational program to build support for sustainable habitat management in local communities. The Act has also helped fund activities in the Upper Gulf of California and Colorado River Delta Biosphere Reserve, a Western Hemisphere Shorebird Reserve Network Site of international importance (see following article in this edition of the *Bulletin*).

For more information about the North American Wetlands Conservation Act, please contact the U.S. Fish and Wildlife Service's North American Waterfowl and Wetlands Office in Arlington, Virginia at 703-358-1784, or the National Institute of Ecology/SEMARNAP in Mexico City at 011-52-56-24-33-05.

*Roxanne Bogart is a Wildlife Biologist with the North American Waterfowl and Wetlands Office in Arlington, Virginia.*

**Listed as threatened in Mexico and endangered in the U.S., the wood stork forages mainly in freshwater marshes, ponds, and lagoons and nests colonially in swamps and mangroves.**

*Photo by Barron Crawford*



by Martha Román R.

# Managing Wetlands in Northwestern Mexico



*Least bittern*  
Corel Corp. photo

***An ejido ecotourism group canoeing at Ciénega de Santa Clara. Partners recognize the importance of working with local communities that depend upon wetlands and wildlife for food, income, and other economic benefits.***  
IMADES photo



The Mexican government established the Upper Gulf of California and Colorado River Delta Biosphere Reserve in June 1993 to protect and restore one of the most productive and diverse coastal areas in Mexico. Due to its importance for native and migratory birds, such as waterfowl and shorebirds, several of Mexico's Federal, State, and non-government agencies have collaborated to promote on-site monitoring and management, environmental education, public involvement, and long-term protection of the Reserve.

In July 1994, the Golfo de Santa Clara Field Station/Instituto del Medio Ambiente y Desarrollo Sustentable de Sonora (IMADES) was constructed with support from the Mexican Federal and Sonora State governments. The station, which includes six adobe buildings and an aquaculture facility, is located in the fishing town of El Golfo de Santa Clara in the northernmost area of the Gulf of

California, close to the Colorado River Delta and about 105 kilometers (65 miles) from the U.S.-Mexico border.

A 1996 grant from the North American Wetland Conservation Council allowed field station personnel to complete construction and begin operation of the station. The station is now a permanent site for promoting the Reserve and for public involvement, environmental education, and protection of the Reserve Core Zone. The station accommodates and supports more than 100 scientists that study this important region. Other partners include Conservation International, National Institute of Ecology/SEMARNAP, and the State Government of Sonora.

The project grant also funded bird monitoring of the Core Zone wetlands, such as the Ciénegas de Santa Clara-El Doctor complex and the Colorado River Delta tidal wetlands. Results included a bird checklist of about 170 species, status assessment of breeding populations, census of migratory birds, and records of such important wintering species as the bald eagle (*Haliaeetus*





**The Golfo de Santa Clara Field Station includes an aquaculture facility for experimental culture of marine species and accommodations for more than 100 scientists.**

IMADES photo

*leucocephalus*), white pelican (*Pelecanus erythrorhynchos*), and peregrine falcon (*Falco peregrinus*). Ciénega de Santa Clara supports species such as the Yuma clapper rail (*Rallus longirostris yumanensis*) and least tern (*Sterna antillarum*), which are listed by Mexico as endangered, and the least bittern (*Ixobrychus exilis*) and elegant tern (*Sterna elegans*), which are listed by Mexico as threatened.

During the project, partners worked with local organizations and communities to provide training in activities such as ecotourism, fish aquaculture, fisheries monitoring, and habitat restoration and enhancement. They also promoted public involvement in conservation and environmental education through short courses, world bird count festivals, brochures, T-shirts, wetland workshops in schools, and a calendar and promotional video of the Reserve's Core Zone wetland habitats.

These efforts and close collaboration of Reserve managers have enabled IMADES to identify opportunities for wetland management and restoration. Further, the station has gained broader recognition and support from non-governmental organizations, local communities, research and education

institutions, and government agencies in northwestern Mexico and the southwestern United States.

*Martha Roman R. is with the Golfo de Santa Clara Field Station, Instituto del Medio Ambiente y Desarrollo Sustentable de Sonora (IMADES), Golfo de Santa Clara, Sonora, Mexico.*

**In 1993, the Mexican government designated the Upper Gulf of California and Colorado River Delta Biosphere Reserve, which supports a multitude of resident and migratory species such as these black skimmers (*Rynchops niger*).**

IMADES photo



by Lisa J. Petit

# Shade-Grown Coffee: It's for the Birds



**Montane forest species, such as the red-headed barbet (*Eubucco bourcierii*), are displaced through production of sun-grown coffee.**

**Habitats that maintain an overstory of tall trees and a dense understory, such as native forest and shade-grown coffee plantations, are able to support these birds.**

*Photo by Alan Williams, Smithsonian Migratory Bird Center*



**Many species of neotropical migratory birds, such as Blackburnian warblers (*Dendroica fusca*), depend on forested habitats throughout their annual life cycle. Blackburnian warblers occupy shade-grown coffee plantations throughout the winter in many areas of Latin America.**

*Photo by Alan Williams, Smithsonian Migratory Bird Center*

Every morning, people around the world start their day with the same ritual: they pour themselves a cup of coffee. The United States is one of the world's largest consumers of coffee, and for many Americans, coffee seems to have become a national obsession, elevated from a mere beverage to a status symbol in some social circles. Ask most of those people about the coffee they drink and they can provide detailed information about their favorite coffee vendor, favorite brand, and favorite roast. But ask those same people how their favorite coffee was *grown* and they may look at you blankly. What most coffee-drinkers often don't realize is that this stimulating brew links them inextricably with the future of tropical forests and the wildlife that relies on those forests.

After its introduction into the New World tropics from Africa in the 18th century, coffee (*Coffea arabica*) traditionally was grown as an understory shrub under a canopy of native trees since that variety required shade for optimal growing conditions. Early coffee farmers often cleared only the forest undergrowth, substituting coffee shrubs into the understory. The result is a crop system that can support much of the diversity found in undisturbed forest. In fact, to the average observer, some shade coffee plantations viewed at a distance are hardly distinguishable from tropical forest. Beginning in the 1970's, however, coffee production methods underwent dramatic changes by removing all or most of the native shade trees to produce varieties of coffee that grow in full sun.

The push to grow "sun coffee" arose for two primary reasons: to avoid the spread of fungal coffee blights and to

increase short-term yields. Unfortunately, this shift toward more "modern" methods of coffee production comes at a large economic and environmental price. The removal of overstory trees increases erosion and competition by weedy plant species amid the coffee shrubs. Soil nutrient levels decrease because of reduced accumulation of leaf litter and the absence of the leguminous, nitrogen-fixing trees, such as *Inga* and *Erythrina*, commonly used in shaded plantations. Thus, sun coffee plantations, like many other modern agricultural systems, require heavy applications of agrochemicals such as fungicides, herbicides, and fertilizers. This has ramifications not only for the workers involved in this type of cultivation but also for wildlife.

As wildlife habitat, sun coffee plantations often become veritable deserts, both because of the lack of vegetative diversity and the effects of chemicals. Ecological studies in Mexico, the Caribbean, Panama, and Colombia have documented that sun coffee plantations may support 60 to 80 percent fewer bird species than shaded plantations. In contrast, plantations with even a moderate diversity or density of shade trees can support high avian diversity, second only to undisturbed forests in many regions. More importantly, a large proportion of birds found in shade coffee habitats are forest-associated species. And birds are not the only animals that benefit from the shade tree method of cultivation. Research on neotropical ant and bat communities provides further evidence of the importance of shade coffee plantations for conserving biological diversity as tropical forests continue to be lost.



Shade coffee plantations are particularly good habitats for a number of bird species—the neotropical migrants—that travel between North American breeding grounds and tropical wintering areas.

Northern orioles (*Icterus galbula*), broad-winged hawks (*Buteo platypterus*), and the Wilson's (*Wilsonia pusilla*), black-throated blue (*Dendroica caerulescens*), and Tennessee warblers (*Vermivora peregrina*) often reach their highest local abundances in shade coffee habitats. Swainson's thrushes (*Catharus ustulatus*) can be found following army ants or congregating high in trees in large groups as they gorge themselves on small, avocado-like fruits during spring migration. For these species, and especially for many resident birds including brilliantly colored tanagers, toucans, oropendolas, and even resplendent quetzals (*Pharomacrus mocino*), the continued widespread conversion of shade to sun coffee plantations could ultimately remove the safety net that sustains migratory and resident bird populations in regions where forest habitats are absent or limited in extent (see next article).

So, what does all this have to do with the double latte purchased by the average suburbanite? Quite a lot, actually. But the issue is not as simple as sun versus shade.

Because there often is a higher cost outlay associated with growing sun coffee, those plantations tend to be owned by larger, wealthier landowners. Smaller landowners generally operate shaded plantations, which provide soil nutrients and stability as well as the economic stability gained by using a diversity of exploitable plants such as *Citrus*, bananas, palms, and timber species to provide the shade. Yet, for a variety of reasons, there remains much pressure on these smaller farmers to convert shade plantations into more profitable sun coffee or subsidized cattle ranching, either of which would translate into further deforestation. Most of the existing shade coffee plantations in the New World lie in these small holdings.

Unless those smaller farmers are able to reap greater economic benefits from traditional coffee cultivation, there will be little incentive to maintain these refuges of biodiversity. Therein lies the important role of coffee consumers.

Would you pay more for your coffee if you knew you would also be protecting habitat and conserving birds throughout the hemisphere? In the last two years, several U.S. coffee companies have begun to ask consumers to do just that, attempting to merge our passion for coffee with the increasing awareness of the global environment. Coffee drinkers now will be able to buy coffee labeled as “shade-grown” for about the same price as other gourmet or specialty coffees.

Rarely in conservation do these sorts of win-win situations arise. Successful marketing of shade-grown coffee is good for everyone involved, for the growers, the roasters, the consumers, and ultimately for the birds.

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*Lisa J. Petit is a Research Wildlife Biologist with the Smithsonian Migratory Bird Center in Washington, D.C.*

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**The difference between sun-grown coffee (above) and shade-grown coffee (below) is striking. For more information about shade coffee and birds, please visit the Smithsonian Migratory Bird Center home page at <http://www.si.edu/smbc>.**

*Photos by Lisa Petit, Smithsonian Migratory Bird Center.*



by Jose Manuel Zolotoff  
Pallais

# Growing Coffee in the Volcano's Shadow



**Coffee represents an important cash crop in Latin American countries. Coffee berries have been harvested the same way for hundreds of years—by hand. Berries are collected in baskets, then placed in bags that weigh nearly 100 pounds, and transported by foot to a central collection site, often hundreds of yards up or down a steep slope.**

*Photo by Ashley Harris, Smithsonian Migratory Bird Center.*

**Forest-dependent neotropical migrants, such as the worm-eating warbler (*Helminthos vermivorus*), can regularly be found in the dense understory of shade-grown coffee plantations. This species virtually disappears, however, if the canopy trees are removed and the coffee is grown in a "sun" plantation.**

*Photo by Daniel Petit, USFWS*

*"I'll have a bag of coffee, please!"* It's a common request that we Nicaraguans have at the corner market each morning. Many of us can't begin our day without our usual cup of coffee.

But few people are aware of the arduous process by which that bag arrives in our hands, beginning with the way the coffee is planted, the different ways it is grown, and the hundreds of people needed to harvest, wash, dry, and distribute the coffee within and outside of Nicaragua. And even more people are unaware of the efforts now underway to ensure that production of coffee does not harm the rich bird and plant life of Nicaragua.

## **Agriculture: A source of contamination in Nicaragua**

Historically, Nicaragua's economic development has been based primarily on agricultural exports, leading to intensive and indiscriminate use of

agrochemicals. During the 1950's, Nicaragua became Central America's leading importer of agrochemicals.

In the country's coffee-growing regions, misguided decisions were made to combat *la roya*, coffee leaf rust (*Hemileia vastatrix*), by removing shade trees and growing the coffee in full sun. At the same time, attempts to combat *la broca*, the coffee-boring beetle (*Hypothenemus hampei*), demanded intensive chemical controls, all leading to the destruction of one of the most sustainable and environmentally benign agroecosystems in Nicaragua: traditional shade-grown coffee farms. This shift towards more technical methods of coffee production brought disastrous





economic, social, and environmental consequences.

Nicaragua has 74,000 hectares (183,000 acres) under coffee production, with the dominant system now being "technified" or sun coffee. In addition to large concentrations of chemicals being applied year after year, increased development of sun coffee plantations results in the loss of forest habitats. The disappearance of forests often also means the disappearance of many spectacular birds, such as the pale-billed woodpecker (*Campephilus guatemalensis*), similar to the ivory-billed woodpecker (*Campephilus principalis*) of North America, and the keel-billed toucan (*Ramphastos sulfuratus*), one of the most colorful and recognizable species in the New World tropics. Also, some neotropical migrants, such as yellow-throated vireos (*Vireo flavifrons*) and orange-crowned warblers (*Vermivora celata*), may not fare well with conversion of native forest to sun coffee.

#### Coffee with a Mombacho aroma

But all is not lost yet. Currently in Nicaragua, some organizations are promoting programs to assist small and medium-sized coffee producers to move toward organic production and replace the shade trees.

Fundacion Cocibolca is a non-governmental organization that manages the Volcan Mombacho Nature Reserve, located on the shore of Lake Nicaragua, southeast of Managua. This protected area extends up the slopes of the inactive Mombacho volcano, encompassing the last remnant of Pacific cloud forest in Nicaragua. It is home to toucans and parrots (which are threatened by a thriving illegal bird trade) as well as to 87 species of orchids and an endemic butterfly. The Fundacion promotes the conservation of native habitats, and has begun studies to compare the sustainability of organic and nonorganic coffee farms. Applying a coffee production system that is more environmentally healthy, and at the same time economi-



cally viable, is not just a dream, but a goal to benefit everyone.

*Jose Manuel Zolotoff Pallais is an Ecologist with Fundacion Cocibolca in Nicaragua.*

**Tennessee warblers (*Vermivora peregrina*) nest as far north as Alaska, then migrate in large flocks to Central and South America for the winter. This species can be abundant in shade-grown coffee plantations, especially if there are flowering shade trees from which this normally insectivorous species sips nectar.**

*Photo by Alan Williams, Smithsonian Migratory Bird Center*



**The ripening process transforms green coffee berries to a brilliant red. The red berries are sometimes called cerezas, or "cherries," by the local people. Harvest usually takes place between August and December**

*Photo by Alan Williams, Smithsonian Migratory Bird Center*

# Outfoxing the Fox

by Karen Boylan



**Aleutian Canada goose**

Photo by B. Moose Peterson/WRP

Long-term ecological horizons are difficult to see in a world where dramatic changes occur almost daily. Many of these changes are negative and are caused by human activity. But sometimes human activities work the other way. The Aleutian Canada goose (*Branta canadensis leucopareia*) was one of the first species listed as endangered. Once reduced to fewer than 800 birds, a recent winter survey in California indicates a population now in excess of 24,000 individuals. After 25 years of conservation efforts with a variety of partners, which include State waterfowl biologists and private landowners in California and Oregon, the Pacific Flyway Council, and Fish and Wildlife Service (FWS) biologists from Regions 1 (Pacific) and 7 (Alaska), the Aleutian Canada goose has recovered to the point where it may no longer need Endangered Species Act protection.

Important features of the recovery program included: 1) removal of non-native arctic foxes (*Alopex lagopus*) from nesting islands; 2) translocation of molting family groups from Buldir Island to other fox-free islands in the Aleutians; 3) banding of birds on the breeding grounds to identify important wintering and migration areas; 4) acquisition,

protection, and management of important wintering and migration habitat; and 5) closure of wintering and migration areas to hunting of Canada geese. The FWS reclassified the Aleutian Canada goose from endangered to threatened in 1990, and the bird's numbers have continued to increase.

Although the breeding populations in Alaska's central Aleutians and Semidi Islands have not rebounded like those in the western Aleutians, the overall numbers are three times the minimum population target required for recovery. Enough migration and wintering habitat is now being conserved and managed in Washington, Oregon, and California to support additional population growth. A program to restore the Aleutian Canada goose to the Asian portion of its range is underway. On the strengths of the population increase and substantial progress on conserving and managing migration and wintering habitat, the FWS is reviewing the status of this subspecies to see whether the Aleutian Canada goose has fully recovered and can safely be removed from Endangered Species Act protection.

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*Karen Boylan is a Biologist with the FWS Anchorage, Alaska, Regional Office.*

## **Arctic fox**

Corel Corp. photo





# Partners in Flight-Canada

by Judith Kennedy

**P**artners in Flight-Canada is a national program to ensure the long-term viability of populations of native Canadian landbirds across their range of habitats. This requires taking action *before* species become endangered. To be successful, we must form partnerships across a broad spectrum of land managers, including foresters, farmers, and municipal planners whose decisions affect landbird habitat.

The first of these landbird conservation partnerships is the Partners in Flight-Canada National Working Group (NWG), currently chaired by the Canadian Wildlife Service. The group's role is to implement national-level activities that, in turn, support landbird conservation at the regional and local levels. After consultation among a variety of interested parties, the NWG developed the "Framework for Landbird Conservation in Canada," which identifies five program components: planning, outreach, monitoring, research, and applied conservation. Each component has objectives that should help partners identify where they can make a contribution. NWG members include Bird Studies Canada, the Canadian Nature Federation, the Canadian Pulp and Paper Association, the Canadian Wildlife Federation, the Society of Canadian Ornithologists, and Wildlife Habitat Canada.

To date, NWG efforts have focused on providing tools that help identify regional conservation priorities. One of these tools is a species priority database of landbird range information and population status. Land managers can use the database to identify the species and habitats for which they have the greatest responsibility and those species that are of greatest conservation concern. For example, grassland species like Sprague's pipit (*Anthus spragueii*) and

boreal species like the blackpoll warbler (*Dendroica striata*) are ranked high in both responsibility and concern.

Another national product is the Canadian Landbird Monitoring Strategy. It revealed that many grassland species are not well covered by the Breeding Bird Survey (BBS), which indicates a weakness in our ability to detect population trends. To address that issue, a pilot project was developed within the Canada's prairie region to improve coverage of grassland species by running BBS routes along the minor roads that cross extensive grasslands. Although the pilot project is not yet complete, early indications are that survey coverage for some of the grassland species of highest concern—Sprague's pipit, Baird's sparrow (*Ammodramus bairdii*), the chestnut-collared and McCown's longspurs (*Calcarius ornatus* and *Calcarius mccownii*, respectively)—is improved.

The next phase of the program is to present the species priority database at workshops in each of Canada's five regions (Atlantic, Quebec, Ontario, Prairie, and Pacific) by March 1999. These regional workshops should result in: identification of priority issues; development of a coordinated action plan to address priority issues; and assignment of tasks that make the best use of the skills and resources available. We hope that, with Partners in Flight-Canada implemented, the list of secure bird species will grow as the ranks of potentially endangered landbirds shrink.

For more information, contact Partners in Flight-Canada National Working Group, P.O. Box 79040, Hull, QC J8Y 6V2 Canada.

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**Baird's sparrow**

Photo by R. & N. Bowers/VIREO®

by J. Christopher Haney,  
David S. Lee, and  
Martha Walsh-McGehee

# Winter in the Bahamas May be No Vacation for Kirtland's Warbler



**Kirtland's warbler**

Photo by Richard Baetson/USFWS

New findings have begun to question long-held beliefs about the wintering grounds of the endangered Kirtland's warbler (*Dendroica kirtlandii*). For most of the past 30 years, it was assumed that this Neotropical migrant's wintering habitat in the Bahamas was low scrub, which is not only abundant but also relatively stable from change. But these assumptions have been challenged with a variety of analyses conducted on reports compiled since 1841 (Haney et al. 1998, *Condor* 100: 201-217).

It all started with a 1995 sighting of a Kirtland's warbler in what seemed to be atypical habitat on Grand Bahama Island. Rick Oliver of the Bahamas National Trust was giving us a tour of Lucaya National Park, where native vegetation of Caribbean pine (*Pinus caribaea*) overtops a diverse understory. Up popped a Kirtland's warbler, and for the next several minutes this very active bird gave us quite a show. Days later, Lee relocated the bird here.

Because Kirtland's warblers were not supposed to use pine habitat in winter, curiosity prompted us to delve deeper into the historical record. For a century and a half, researchers and other observers visiting the Bahamas between August and May had accumulated sight reports and specimen records of the warbler. But Kirtland's warblers have been extremely difficult to find during this season, so we used a survey technique that employed acoustic playback in an attempt to elicit more detections of this elusive bird.

Field surveys from 1995 to late 1997 revealed at least six more Kirtland's warblers, all in pine woodland with evidence of recent low-intensity fire. (Even more reports from pine habitat were gathered over the 1997-1998 winter.) Acoustic surveys conducted during these recent winters revealed Kirtland's warblers in pine woodlands on the islands of Abaco and Grand Bahama more frequently than expected.

Based on the historical record, we were able to track down 101 accessible reports of 194 individual Kirtland's warblers through November 1997. The vast majority of reports (88 percent) were from the northern Bahamas, and 74 percent originated from pine-dominated islands. Most (75 percent) individual birds during the past century were also from northern islands dominated by Caribbean pine. Between 1841 and 1915, 78 percent of all museum specimens collected in the Bahama Archipelago came from the six pine-dominated islands or island groups.

Because of the irregular manner in which reports were obtained, we checked for potential biases in the historical record. Despite analyses for misidentification in sight reports and unequal survey effort across islands, we found no evidence to support previous speculation that Kirtland's warblers preferred scrub or avoided pine habitats during winter. Indeed, where habitat descriptions had been noted by observers, at least 60 percent specifically mentioned pines and pine understory.

More significantly, variability in the warbler's breeding population corre-



sponded to periods of habitat alteration in the Bahamas. Two periods of apparent decline of the Kirtland's warbler this century occurred when Caribbean pine was extracted at commercial scales.

Degradation of the pine ecosystem in the Bahamas accelerated between 1956 and 1973, a period that encompassed the precipitous 60 percent decline in warblers observed between the 1961 and 1971 breeding censuses. A modest population increase of the warbler on the breeding grounds since 1990 has taken place after two decades of recovery in the fire-dependent pine ecosystem in the northern Bahamas.

Due to nest parasitism by cowbirds (*Molothrus ater*) and relative scarcity of jack pine nesting habitat in Michigan, the Kirtland's warbler is usually thought of as "breeding season-limited." Surprisingly, we found that the breeding range (the area circumscribing known breeding sites) is actually 35 percent larger than the area of the entire Bahama Archipelago and 10 times larger than the area of Bahamian pine woodland. A severely restricted winter range could be even less able than the breeding grounds to withstand extensive habitat modifications and, hence, may be limiting Kirtland's warbler populations.

But we caution that strong conclusions about the cause(s) of population trends in this Neotropical migrant have been complicated by events that transpired simultaneously on the breeding and wintering grounds. In February 1998, researchers and recovery team members met on New Providence and Grand Bahama islands to survey warblers and discuss prospects for greater conservation of this species during winter. Our field work was organized by the Bahamas National Trust (Rick and Kathy

Oliver), and included local ornithologists as well as the Bahamas Ministry of Agriculture and Fisheries (Eric Carey). Representatives from the recovery team included the U.S. Fish & Wildlife Service (Mike DeCapita), USDA Forest Service (Phil Huber), and Michigan Department of Natural Resources (Jerry Weinrich). North American organizations taking part in the field surveys included the North Carolina Museum of Natural Sciences (Lee), The Wilderness Society (Haney), and The Nature Conservancy (Dave Mehlman, Dave Fwert).

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**Bahamian pine woodland**

*Photo by J. Christopher Haney*



by Jennifer Burley

# Nature Tourism in the Rio Grande Valley



**Buff-bellied hummingbird (*Amazilia yucatanensis*)**

Photo by J. Dunning/VIREO®

When I think about my favorite foods, I think ingredients: Feta cheese. Fresh alfalfa. Lemon pepper pasta. White chocolate. And when I think about my favorite birding spots, I, too, think ingredients: Bentsen-Rio Grande Valley State Park. Santa Ana National Wildlife Refuge. Sabal Palm Grove Sanctuary. Even the Brownsville Dump. If you're a birder, you know what I mean. Because simply hosting the birds is one wondrous thing, and having successful places for viewing is another. The Lower Rio Grande Valley in Texas is the right place at the right time: oases of viewing opportunities of special

birds amidst a backdrop of border towns with increasing services for tourists, particularly birders.

The City of McAllen is one such place. With over 100,000 people, 2,500 hotel rooms, over 500 restaurants, and a location only 10 miles (16 kilometers) from the Rio Grande, McAllen is no dusty border town, but it does have a small town feel, complete with birder-friendly services and a quick ride to excellent nature spots. The McAllen International Airport is near the McAllen Marsh, a retired wastewater holding pond where one can see the least grebe (*Tachybaptus dominicus*) and black-necked stilt (*Himantopus mexicanus*), as well as other valley specialties. Guest at many hotels frequently hear red-crowned parrots (*Amazona*

*viridigenalis*). A local plant store neighbors an active green parakeet (*Aratinga holochlora*) nesting area. And it doesn't stop there. The streets of McAllen, appropriately enough, are named after birds, flowers, and trees.

"Birdwatcher-watching" has become a favorite pastime of many city officials, and the results include land acquisition for preservation, butterfly and hummingbird gardens, and even the first Director of Nature Tourism position in the country in the McAllen Chamber of Commerce. The Chamber is also the founder and sponsor of the annual Texas Tropics Nature Festival, a celebration of birds and biodiversity held every



April. Birds are making a splash here in drought-stricken McAllen.

The reasons for cities like McAllen to take yet another look at nature tourism keep growing. Birding is big bucks, certainly. The economic impact of the 1998 nature festival alone is projected at nearly a half a million dollars. Birders coming to the valley throughout the year—about 40,000 of them—adding another \$45 million to that figure and supporting 589 jobs in the area. On the whole, this means lots of nature dollars. Furthermore, birders are excellent guests. They don't trash the hotel rooms several weeks a year during spring break, they tread gently in the towns and on the trails, and they like to read.

But no matter what your college advisor said, money isn't everything. The educational rewards of nature tourism surpass all expectations. Who would have thought that local chambers of commerce, museums, nature centers, national refuges, and hotels would team together to accomplish butterfly and hummingbird gardens on their properties? If it isn't revolutionary, it is at least noble, and great for our feathered and winged friends of all sizes.

One hotel in particular, the Microtel, has put up a mounted hummingbird feeder for the resident buff-bellied hummingbird (*Amazilia yucatanensis*), enabling many a birder to add this "micro-bird" to their life list right on-site. Even more, hotel manager Jim Stiles recently installed a birders' library that guests can borrow from while they stay at the hotel. One can browse American Birding Association's driving guide, "Birding in the Rio Grande Valley," or study a bird field guide. You can't beat this Texas hospitality.

The more the community of McAllen can understand how fragile and precious the habitats are around it, the more its members will join the well-worn paths to Santa Ana and Sabal Palm, and collectively work to establish more viewing opportunities, preserve more habitat, and plant more gardens. The city, State, and Federal efforts empower community



members to turn even their own backyards into bird havens.

*Jennifer Burley is a free-lance writer in McAllen, Texas.*

*The green jay (Cyanocorax yncas) is just one of the colorful birds that can be seen by visitors to the Lower Rio Grande Valley.*  
Photo by Larry Ditto ©



by L. Peter Boice

# Migratory Bird Conservation at Fort Hood ●

*F*ort Hood, a major Army training base located on approximately 220,000 acres (88,000 hectares) in central Texas, supports the largest known breeding populations of the endangered black-capped vireo (*Vireo articapillus*) and golden-cheeked warbler (*Dendroica chrysoparia*) under any single property management. Both birds have very small breeding ranges—black-capped vireos nest in central Texas and southern Oklahoma, while golden-cheeked warblers nest only in central Texas.

*A golden-cheeked warbler (right) finds it is now raising a brown-headed cowbird. Nest parasitism by cowbirds is thought to be a significant factor in the decline of golden-cheeked warblers and black-capped vireos.*

*Photo by M. Lockwood/VIREO®*





They also have specialized habitat needs. Black-capped vireos require hardwood scrub habitat consisting of patchy shrubs and thickets interspersed with live and dead trees. Golden-cheeked warblers require mixed hardwood stands consisting of ash juniper and a variety of oak species. Habitat loss is a major threat to the survival of both species. However, nesting failure due to nest parasitism by brown-headed cowbirds (*Molothrus ater*) has been the main factor in the decline of the black-capped vireo and is likely to be a significant factor affecting the warbler.

An active cowbird control program at Ft. Hood has reduced the parasitism problem from a documented loss of 92 percent of black-capped vireo nests in 1988 to less than 20 percent for the past three years, and less than 10 percent for 1997. Although rates for the golden-cheeked warbler were not studied, cowbird control is assumed to have helped this species as well. Both populations are now healthy, growing, and appear to be sustainable, which was not the case before the cowbird control program was started. There are currently estimated to be more than 400 nesting pairs of black-capped vireos and 2,000 nesting pairs of golden-cheeked warblers on the base.

Ft. Hood is using a variety of technologies to monitor the birds, including video cameras, satellite imagery, global positioning systems (GPS), and radio telemetry. For example, miniature video cameras recently detected for the first time the region's non-native fire ants preying on a nest of black-capped vireos. In another project, miniature transmitters are being affixed to the cowbirds to monitor the birds' movements. This information has been invaluable in helping managers from Ft. Hood and researchers from The Nature Conservancy formulate a recovery plan for the vireos and warblers by delineating where cowbirds feed and congregate. A GPS is used to pinpoint vireo and warbler nest locations, and a

Geographic Information System helps define patterns of data on topography, vegetation, and species occurrences.

What sets Ft. Hood apart is its successful ability to integrate a range of technological applications with on-the-ground management. For example, data collected during the 1997 nesting season suggest a strong relationship between the distribution of cattle and the frequency of cowbird parasitism. Managers recognize that removing cattle from vireo and warbler habitat may not be practical given the economic realities of central Texas. But researchers from The Nature Conservancy have recommended that Ft. Hood develop grazing practices that rotate cattle out of the habitat during the nesting period. This would not only benefit the endangered birds but also provide more forage for the cattle after the nesting season. If successful, this long-term management solution could successfully accommodate both people and birds without adversely affecting the military mission.



**Black-capped vireo**

Photo by Brian E. Small/VIREO®

*L. Peter Boice is Director, Conservation, Office of the Deputy Under Secretary of Defense (Environmental Security). The Department of Defense manages 25 million acres (10.1 million ha) of public lands in support of the military mission by providing for the sustained use of its land, sea, and air resources; protecting valuable natural and cultural resources for future generations; meeting all legal requirements; promoting compatible multiple uses of resources; and managing resources in a cost-effective manner.*

by Jacquelyn M. Howard

# DoD MAPS Future for Bird Conservation



**The Swainson's thrush (*Catharus ustulatus*), above, and the indigo hunting (*Passerina cyanea*) and Wilson's warbler (*Wilsonia pusilla*), opposite page, are among the many birds being evaluated as part of the MAPS program.**

*All photos by Lisa Petit, Smithsonian Migratory Bird Center.*

The history of the MAPS (Monitoring Avian Productivity and Survivorship) program on Department of Defense (DoD) lands began in 1992 with the establishment of five monitoring stations on three bases—Patuxent River Naval Air Station and Indian Head Naval Ordnance Center in Maryland and Dahlgren Naval Surface Warfare Center in Virginia. From this humble beginning, DoD has expanded its MAPS coverage to support a total of 96 active MAPS stations on 32 DoD installations throughout the east, west, midwest, and south.

The DoD MAPS program is a continent-wide partnership effort aimed at collecting population trend and demographic data on North American landbirds that winter in the neotropics. This suite of birds has suffered dramatic declines in population numbers over the last two decades, and the reasons for these declines are not well understood. The MAPS program seeks to determine the underlying causes by large-scale, long-term monitoring of select sites on DoD installations. We hope the data will give resource managers at these bases a better sense of why these populations are declining and what, if any, management strategies can reverse this downward trend.

Military bases in the United States often provide ideal locations for large-scale, long-term avian monitoring because many provide large areas of breeding habitat for neotropical migratory landbirds. These habitats include both relatively pristine ecosystems as well as ecosystems that are subject to varying management practices. Such areas are critically needed for effective monitoring studies, not only to serve as locations for monitoring the effects of

large-scale or even global environmental processes, but also to serve as experimental areas for monitoring the effects of relatively local land use practices. Indeed, population and demographic data on landbirds are crucial for managers to protect and enhance the installation's avifauna and ecological integrity while allowing it to serve its military purpose.

The data are analyzed to provide information on such factors as productivity (birth rate) and survivorship (death rate), causes of population declines, and suggestions for appropriate management actions to reverse these declines. The minimum time necessary for obtaining survivorship estimates from the mark-recapture techniques used by MAPS is 4 years, although 10-12 years may be necessary for obtaining estimates with high precision and 20-30 years may be needed for a detailed understanding of the underlying trends. The DoD has committed to supporting each of its stations for as long as possible, given budget and staffing constraints.

So far, the continent-wide MAPS program has shown that neotropical migrants appear to have intrinsically low productivity and, consequently, are at greater risk than many other landbird species. On seven midwestern military installations, old field deciduous forested edge, successional stage/mature deciduous forest edge, and riparian woodland habitats were associated with the highest adult population levels, but not necessarily with high productivity. For 15 of 19 species that showed pronounced differences in population trends between western midwest (Kansas/Missouri) and eastern midwest (Indiana/Kentucky) installations, corresponding differences





*Indigo bunting*

in either productivity or survivorship (or both) that explained the differences in population trends were documented. For certain species, it appears that population declines are due to low productivity and can be addressed on the breeding grounds, while for other species declines appear to be due to high mortality rates, which may only be addressed on their tropical wintering grounds. The next step is to obtain GIS habitat and land use information for each of the stations to determine the landscape-level characteristics of the habitat that are associated with high productivity. This will allow us to suggest appropriate management actions to increase productivity for the declining species.

The long-term future of the MAPS stations on DoD lands will be maintained, for the most part, through volunteer effort. The Institute For Bird Populations (IBP), the organization that established MAPS, plans to train existing natural resources managers on DoD bases to oversee the stations and train volunteers from local Audubon Societies and other bird clubs to operate the stations. Indeed, IBP has established a Memorandum of Understanding with the National Audubon Society to encourage its members and chapters to take over the operation of MAPS stations on DoD installations as part of Audubon's citizen

science effort. This innovative partnership may provide the critical long-term information needed to help reverse the declines of neotropical migratory landbirds in North America.

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*Jacquelyn M. Howard is with the Department of Defense Legacy Resource Management Program. The DoD Legacy Resource Management Program provides funding to support conservation of natural and cultural resources on military properties world-wide.*

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*Wilson's warbler*



by Allan J. Mueller

# Returning the Birds to Faulkner's Woods



*Kentucky warbler (Oporornis formosus)*

Photo by Lisa Petit, Smithsonian Migratory Bird Center

The Mississippi Alluvial Valley, which covers parts of seven States from Cape Girardeau, Missouri, to the mouth of the Mississippi River, was once a 9.7 million-hectare (24.2 million-acre) maze of floodplain forests, cypress brakes, rivers, oxbow lakes, and other assorted habitats—altogether the largest bottomland hardwood wetland system in the United States. The novelist William Faulkner, who grew up in Mississippi and wrote about it extensively, was impressed with the changes that occurred during his lifetime, and his writing foreshadowed future changes. Today, 80 percent of “Faulkner’s Woods” is gone, converted mainly to agriculture. The forest that remains is fragmented into over 35,000 patches one hectare (2.5 acre) or larger in size, with an average size of less than 40 hectares (100 acres). Habitat loss and fragmentation at this scale has severely affected the region’s wildlife.

The Mississippi Alluvial Valley Migratory Bird Initiative was launched to identify habitat restoration needs and population goals for neotropical migrants, waterfowl, and shorebirds. These three groups of birds have partially overlapping habitat needs and were used as the basis for an ecosystem scale restoration plan for the Mississippi Alluvial Valley. Neotropical migrants and other birds breed in the remaining forests, waterfowl winter in the forests and agricultural fields, and shorebirds feed and rest on mudflats during spring and fall migration.

Three organizations collaborated to accomplish this daunting planning task: the Southeast Working Group of

Partners In Flight, the Lower Mississippi Valley Joint Venture of the North American Waterfowl Management Plan, and the Western Hemisphere Shorebird Reserve Network. Each organization brought its expertise to the table and blended it with the contributions of the others to develop a quantified, site-specific habitat restoration/protection plan that should meet the long-term needs of all three bird groups. The development of a geographic information system for the entire Mississippi Alluvial Valley by the Lower Mississippi Valley Joint Venture was critical to the success of this project.

The goal for neotropical migrants and other forest breeding birds (70 total



species) is to establish self-sustaining breeding populations for all species. Using information from the technical literature and calculating a theoretical genetically viable population level, we set a goal of at least 500 breeding pairs for each targeted forest patch, which we refer to as Bird Conservation Areas. We multiplied this goal by the average breeding density for each species and added an adjustment factor to overcome the adverse effects of the severe forest fragmentation in the Mississippi Alluvial Valley. To accommodate different associations of bird species, we identified three target Bird Conservation Area sizes: 4,000-8,000 ha (10,000-20,000 acres), 8,000-40,000 ha (20,000-100,000 acres), and greater than 40,000 ha. Although these results remain untested, forest patches of these sizes should support self-sustaining populations of all the forest breeding bird species in the Mississippi Alluvial Valley. Ninety Bird Conservation Areas were located throughout the Mississippi Alluvial

Valley, with approximately 400,000 hectares (1 million acres) of reforestation required to meet these goals. The locations of Bird Conservation Areas were based on the existing forest, reforestation potential, flood frequency, and public lands. Substantial cooperation from private landowners will be essential to achieve these reforestation and breeding bird population goals.

For waterfowl, our goal is to provide enough habitat in the Mississippi Alluvial Valley to support 4.3 million wintering ducks and one million wintering geese. We assumed that food was the limiting factor and calculated food availability and caloric value for each of the three primary foraging habitats: bottomland hardwood forests, moist soil sites, and agricultural fields. By applying waterfowl energy needs to these data, we estimated that 285,000 hectares (712,500 acres) of foraging habitat are needed to support the population goals for wintering waterfowl in the Mississippi Alluvial Valley. This goal is divided

*Photo by Larry E. Marcy*



among the States on the basis of habitat type and public or private ownership. For public lands (State and Federal), the habitat goals are distributed among individual management areas so that each management area has its own waterfowl habitat target and managers are able to see how their actions

contribute to larger ecosystem goals.

The waterfowl population target, developed as part of the national planning effort for the North American Waterfowl Management Plan, was based on 50 years of research and population monitoring. For shorebirds, we had much less research and almost

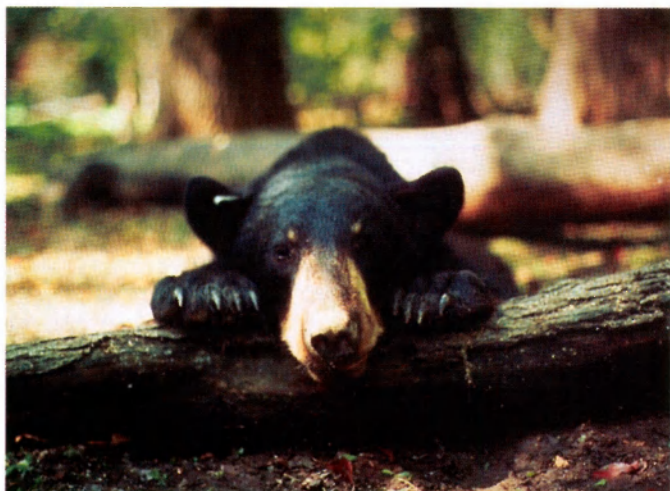
no population data to use in developing population goals. As with waterfowl, food was assumed to be the limiting factor, and we set a goal of supporting 0.5 million shorebirds during their southward migration. The spring migration period was not considered a limiting factor because, during that time, most agricultural fields are bare and many are flooded or wet, providing ample foraging habitat. However, the southward shorebird migration occurs from late July through September, when most of the field are in crops and flood water is rare. We used estimates of invertebrate density, the caloric value of food in the mud flats, and the energy needs of shorebirds to calculate the amount of habitat needed. We included the requirement for shorebirds to be able to gain weight so that they can replenish muscle and fat lost during migration to the Mississippi Alluvial Valley and have enough energy to continue their journey south. We estimate that 2,000 hectares (5,000 acres) of mudflat habitat will be required. This requirement is distributed among various State and Federal management areas, and at this time it appears that the entire

goal can be met on public lands. However, we recognize that substantial shorebird habitat exists on private lands, especially at aquaculture facilities (catfish, crawfish, and bait fish farms are common and widespread in the Mississippi Alluvial Valley). Enhancement of these habitats will be encouraged wherever possible.

To arrive at these goals and recommendations, we made several critical assumptions that should be tested. As habitat development proceeds in response to this plan, research and monitoring will measure the adequacy of these habitat recommendations in meeting the population goals. As we identify shortcomings, management recommendations will be adjusted to incorporate new information.

This planning process has developed a site-specific, coordinated plan that should meet the habitat needs of three groups of migratory birds. To achieve a more complete "ecosystem plan," we will add the habitat needs of other species as their needs are defined. Two important efforts promise to add information in the near future. The Lower Mississippi River Conservation Committee is preparing an Aquatic Management Plan for the lower Mississippi River and the Black Bear Conservation Committee is defining the site-specific needs of the threatened Louisiana black bear (*Ursus americanus luteolus*). Recognizing that the primeval forest cannot be reestablished, we hope to restore the essence of Faulkner's Woods by providing the habitat requirements for as many species as possible.

*Allan J. Mueller is the Field Supervisor for the FWS Vicksburg, Mississippi, Field Office.*



**Louisiana black bear**  
Photo by Dan Anderson



# Charting the Future of the Refuge System

by Rick Coleman

On October 19-21, 1998, the Fish and Wildlife Service (FWS) will host the first Service-wide National Wildlife Refuge System Conference in Keystone, Colorado. The conference is being convened to chart the future course for the Nation's spectacular network of more than 500 refuges and the fish and wildlife resources they support.

One of the biggest goals of the conference is to develop a comprehensive strategy for improving management of the Refuge System. Called "Fulfilling the Promise: Serving Wildlife, Habitat, and People through Effective Leadership," the strategy will make a series of recommendations in the areas of wildlife and habitat conservation, employee development, and public use and communications. Representatives of all FWS programs are on work groups developing the strategy, hundreds of employees commented on the first draft, and a second draft will be available for further employee comment in mid-September. In addition, representatives of all FWS programs will attend the conference.

The National Wildlife Refuge System is at a crossroads as it approaches its centennial anniversary in 2003. It faces growing demands for public uses, inadequate funding for conservation and visitor programs, and lack of recognition by the public. While all have threatened the sustainability and growth of this tremendous wildlife conservation legacy, the refuge system's future is looking brighter than ever before.

The groundwork for change was laid last year when the National Wildlife Refuge System Improvement Act of 1997 was signed into law. For the first time, this law gave the FWS clear, comprehen-

sive guidance on how the refuge system should be managed and used by the public. This "organic law" paves the way for effective, consistent management of the refuge system, and the question of how best to implement the act will be a key component of the conference.

The conference attendees will be asked to develop a strategy for addressing key issues raised by the organic law in such areas as leadership, wildlife and habitat conservation, and "people issues" (e.g., public use and communications).

In addition to the organic law, other milestones were reached last year, including an historic funding increase to address millions of dollars worth of maintenance and operations needs. More than 150 community partners now support refuges, serving as advocates in surrounding communities and bolstering vital conservation programs and visitor services. The National Wildlife Refuge System is enjoying more public support than ever before, and deciding how to maximize the new opportunities presented by this growing support will be an important conference issue.

Going back to the Dust Bowl Days, the refuge system has embodied a proud tradition of wildlife conservation. Today, a trend toward ecosystem restoration on refuges is growing stronger than ever before. America's wildlife refuges are intended as places where *all* wildlife, from trout and turtles to cactus and caribou, are to reign supreme.

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*Rick Coleman is Chief of the FWS Division of Refuges in Arlington, Virginia. For more information on the conference, contact the Division of Refuges at (703) 358-1744.*



**Whooping cranes take flight at  
Aransas NWR**

*Photo by Steve Hillebrand/USFWS*

by Mark Phillips

# The Wild Bird Conservation Act



**Scarlet macaw (*Ara macao*)**  
*Nova Development Corp. photo*

*T*he international wildlife trade has taken a heavy toll on many forms of wildlife and, in particular, exotic birds. As a result, many populations of exotic bird species have become threatened with extinction. Many of these heavily-traded birds belong to the Order Psittaciformes, which includes all of the parrot-like birds such as amazons, macaws and cockatoos. Most occur naturally in the tropics. Argentina, Guyana, Indonesia, Tanzania, and Senegal are recognized as the main exporting countries in the international pet bird trade, although Argentina's exports have declined in recent years. The United States has historically been one of the largest consumers of exotic pet birds. Past estimates of birds imported into the U.S. ranged as high as 800,000 per year.

All members of the Order Psittaciformes, with the exception of the budgerigar and the cockatiel, are afforded protection by an international treaty, the Convention on International

Trade in Endangered Species (CITES). This means that shipments of these exotic birds cannot be exported or imported without valid documents issued by the designated CITES authorities in the country of export and, for exotic birds listed in CITES Appendix I, the country of import as well. CITES requires the exporting country to determine that the export will not be detrimental to the species in the wild. Despite the best intentions of CITES, however, it became clear by the early 1990's that exotic birds were still being shipped internationally in enormous quantities without the required scientific findings or appropriate scientifically-based management plans.

In response to concern about the survival of these species, Congress passed the Wild Bird Conservation Act (WBCA) in 1992. This law, a significant step in international efforts to conserve exotic birds that are subject to trade, affords additional protection to all exotic birds listed in the CITES Appendices.

**Peruvian conures captured for the pet trade prior to export**

*Photo by C. Plowden/Terra/HSUS*





Under the WBCA, all exotic birds protected by CITES are prohibited from importation into the U.S. unless the importation qualifies for one of the permitted exemptions provided in the WBCA or the bird species to be imported is included on an approved list pursuant to the WBCA. Exceptions can be made for scientific research, zoological breeding and display, cooperative breeding, and personal pet birds, but permits must be obtained in advance of import. In addition, the WBCA provides for the development of three approved lists for which no WBCA permit is required. These approved lists are for: 1) captive-bred species of exotic birds for which the Fish and Wildlife Service (FWS) is confident that all specimens in trade are captive-bred; 2) wild-caught species of exotic birds managed in a scientifically-based sustainable manner; and 3) captive-bred specimens of certain exotic bird species from approved foreign breeding facilities. Importations of exotic birds that qualify for one or more of these approved lists do not need WBCA permits, although CITES requirements may still apply. Thus, it would be possible to import certain exotic bird species that may not need a WBCA permit but would still need CITES documents. Additional regulations dealing with foreign captive breeding facilities have been drafted and are now under review.

How successful has the WBCA been in curbing the flow of exotic wild birds into the U.S.? Statistics indicate that, since the enactment of the WBCA, imports of CITES-listed exotic birds have been reduced by more than 90 percent. Those that are being imported are overwhelmingly captive-bred birds. The FWS believes that the U.S. is no longer contributing significantly to depletion of wild bird populations through unregulated trade.

The WBCA also contains a provision for the establishment of an Exotic Bird Conservation Fund, which is authorized to provide financial and technical assistance for projects to conserve exotic

birds in their native countries. The source of this funding would be Congressional appropriations and all amounts received by the Federal government in the form of penalties, fines, or forfeiture of property collected as a result of WBCA violations. No funds have been appropriated to date, but the FWS is continuing to use its other authorities to provide technical assistance to other countries for general CITES implementation and, where possible, wild bird conservation.

The WBCA has proven to be a valuable tool in conservation efforts to protect exotic birds that are subject to trade. The import prohibitions perfectly complement future WBCA-funded conservation projects of exotic birds in their native lands. The WBCA will help to reduce illegal trade in exotic birds and, at the same time, promote the enhancement of exotic bird populations in their natural habitat. We hope this law will inspire other countries to enact similar conservation measures, as the global community works together for the survival of wild birds.

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*Mark Phillips is a Wildlife Biologist with the FWS Office of Management Authority.*



**Blue and gold macaws (*Ara ararauna*)**  
Maslowski Productions photo



Corel Corp photo

# A Tool of Persuasion

As a means of influencing international species conservation on a bilateral basis with other countries, the Administration has at its disposal a relatively obscure, but powerful, law: Section 8 of the Fisherman's Protective Act of 1967 (22 U.S.C. 1978, as amended), better known as the "Pelly Amendment."

This provision requires the Secretary of Commerce or the Secretary of the Interior, as appropriate, to issue a finding ("certify") to the President when nationals of a foreign country are engaging in trade or taking that diminishes the effectiveness of an international program for endangered or threatened species. The Convention on International Trade in Endangered Species (CITES) is such an international program. Once a country has been "certified," the Pelly Amendment authorizes the President to impose trade sanctions against that country. Within 60 days of certification, the President must report his decision to the U.S. Congress; if he has decided against imposing sanctions, he must explain why. The Department of the Interior has used the Pelly Amendment effectively several times in recent years to promote the conservation of CITES-listed species.

Twenty-two foreign countries or entities have been certified under the Pelly Amendment on a total of 34 occasions—31 by the Secretary of Commerce, once jointly by the Secretaries of Commerce and the Interior, and twice by the Secretary of the Interior alone. The Secretaries of Commerce and of Interior jointly certified Japan in 1991 for trade in hawksbill sea turtles (*Eretmochelys imbricata*), and China and Taiwan in 1993 for trade in rhinoceros horn and tiger (*Panthera tigris*) bone. The President has imposed trade sanctions pursuant to the Pelly Amend-

ment on one occasion—in 1994, against Taiwan, for trade in rhinoceros (*Rhinocerotidae*) and tiger parts and products. Sanctions were lifted in 1995 after Taiwan had demonstrated sufficient improvement. The certification of China still stands.

Although the Secretary of the appropriate Department may self-initiate a Pelly Amendment review, most reviews by the Secretary of the Interior have been undertaken in response to external prompting, often by petitions submitted by conservation organizations. Once received by the Secretary, the petition is forwarded to the appropriate agency—the Fish and Wildlife Service (FWS) or, for most marine species, the National Marine Fisheries Service (NMFS)—for review of the allegations. Usually the allegations focus on a country's failure to curb illegal trade in particular species. For example, the FWS currently is reviewing allegations submitted by the Sierra Club Legal Defense Fund that Republic of Korea nationals are illegally trading bear parts and products from species listed on Appendix I of CITES, thereby undermining this multilateral agreement. However, sometimes the petitioners take a broader approach. A petition from the Animal Alliance of Canada, *et al.*, alleges that Canada is undermining both CITES and the Migratory Bird Convention by failing to enact and enforce legislation to implement those two multilateral agreements. This petition is currently under review.



Pelly Amendment review is a thorough, consultative process. The appropriate agency, FWS or NMFS, begins by publishing a *Federal Register* notice requesting public comment and by opening the interagency consultation process with the State Department and other agencies. Separate meetings with the foreign country's embassy and with the petitioners provide the opportunity to sharpen our analysis of the situation through posing questions to both sides. Each allegation is evaluated solely on its merits using the best available information, with advice from agency law enforcement specialists, Departmental solicitors, and the Justice Department. Later, if certification appears imminent, the Office of the U.S. Trade Representative will also become involved.

Once the FWS or NMFS has made its recommendation, the Secretary of the appropriate Department reviews the evidence and decides whether or not it is sufficient for certification. While the law compels the Secretary to certify when the facts support it, the Department of the Interior has historically favored working with foreign governments to address deficiencies in their enforcement regime before rushing to a Pelly certification.

The threat of possible U.S. trade sanctions, or international embarrassment from certification, can provide powerful leverage for change. More important than the imposition or non-imposition of sanctions, however, is the conservation benefit that the Pelly process provides. Once certification has taken place, the FWS uses cooperative problem solving to benefit the species, rather than stressing the adversarial aspect. In the case of Taiwan, the benefits of the Pelly process extended far beyond the original rhinoceros and tiger focus, resulting in cooperative law enforcement training between the FWS and the Taiwan Council of Agriculture, improved international wildlife trade controls by Taiwan, and greater involvement in endangered species conservation by Taiwan authorities. As another

example, a Pelly certification led to Japan's lifting of its CITES reservation on the hawksbill sea turtle, an endangered species. Finally, the Pelly certification of China led to improvements in CITES implementation in China and increased the level of bilateral cooperation between the FWS and China's Ministry of Forestry, although much room for improvement remains.

The Pelly process has provided an important catalyst for cooperative international endangered species conservation. The FWS hopes that whatever the finding in the case of any current Pelly petition, the net outcome will be greater cooperation in CITES implementation, and improved conservation benefits for endangered and threatened species. Ultimately, it is the continuing dialogue that makes the Pelly process work.

*Theodora (Teddy) Greanias is a CITES Policy Specialist in the FWS Office of Management Authority.*



**Traditional medicinals may contain derivatives from the bones of CITES species such as tiger and bear.**  
USFWS photo

**This "Do Not Buy Wildlife Products" display at Kimpo Airport in Seoul, South Korea, contains pangolin, leopard skin, sea turtle, elephant ivory, and medicinals made from tiger bone and rhinoceros horn.**  
USFWS photo



by Nancy C. Brown

# Lower Rio Grande Valley National Wildlife Refuge



**Great kiskadee (Pitangus  
sulphuratus)**

*Photo by Larry Ditto®*

*F*rom old Military Highway along the Rio Grande, crop dusters can be seen soaring above acres and acres of straight crop rows. To many people who live along this stretch of highway, the few isolated patches of brush still found in this area are wasted agricultural space or cover for weary illegal border-crossers. To others, the brush simply goes unnoticed.

A closer look at those brush patches reveals small blue goose signs that identify the Lower Rio Grande Valley National Wildlife Refuge (NWR). In English and Spanish, the signs do more than establish the refuge boundary; they reflect the efforts of a partnership to preserve an amazing natural resource that sustains countless species, many of them listed as threatened or endangered.

The extreme southern tip of Texas contains a documented 1,100 plants, 287 butterflies, and approximately 900 vertebrates, at least 465 of which are birds. To protect this important diversity, the refuge was established in 1979 under the authority of the Fish and Wildlife Act of 1956. Designated by the Fish and Wildlife Service (FWS) as one of its top priority acquisition areas, the refuge, when complete, will provide for the protection of 132,500 contiguous acres (53,625 hectares), making it one of the most biologically diverse habitat corridors in the continental United States.

Since the 1920's, 95 percent of the native habitat found within the lower delta has been cleared or altered for agricultural or urban development. More recently, the North American Free Trade Agreement (NAFTA) has further stimu-

lated urbanization, bringing with it the expansion of industry, several new international bridges, and added tensions to the ever-complicated battle over water rights. These and other forms of encroachment have relegated native plants and animals to isolated remnant tracts, possibly compromising the genetic integrity of many species. Hoping to connect these tracts, creating a "string of pearls" effect, the refuge seeks to conserve biodiversity through land acquisition, habitat restoration, and conservation education.

From Falcon Dam to the Gulf of Mexico, the refuge follows the Rio Grande along the last 275 river miles (440 kilometers), connecting isolated tracts of land managed by private landowners, non-profit organizations, the State of Texas, and two other NWRs, Laguna Atascosa and Santa Ana. Thousands of years of geographic change and evolutionary adaptation have resulted in the creation of 11 distinct plant and animal communities in the four most southern counties of Texas. Portions of each of these biotic communities are represented in the Lower Rio Grande Valley NWR.



The Ramaderos biotic community is found at the western edge of the refuge.

This arid landscape is cut by deep arroyos and small tributaries that extend for miles from the Rio Grande. Wildlife travels unimpeded down the humid corridors of lush riparian vegetation, particularly during times of drought and extreme heat. The biota of these natural drainages is a result of higher moisture and deeper soils. A tree typically foraged upon by white-tailed deer and cattle, the seemingly unobtrusive guayacan (*Guaiacum angustifolium*), has a root system that plant ecologists speculate may endure for about 1,000 years.

At the eastern edge of the refuge, impaled insects and small rodents adorn the blades of large, 100-year-old yuccas called Spanish daggers (*Yucca treculeana*), compliments of a migratory bird, the loggerhead shrike (*Lanius ludovicianus*). The irony of this macabre scene is not lost on the people who visit Palmito Ranch, site of the last land battle of the Civil War and a refuge tract that falls within the Clay Loma/Wind Tidal Flats. This biotic community is interspersed with saline flats, marshes, shallow bays, and unique dunes of wind-blown clay known as lomas. Following the last few miles of the Rio Grande, this refuge tract links coastal and river corridors and is staging ground for the endangered peregrine falcon (*Falco peregrinus*). It is also habitat for 20 other State- and federally-listed threatened and endangered species, including the brown pelican (*Pelecanus occidentalis*) and Kemp's ridley sea turtle (*Lepidochelys kempii*).

A species of great concern to FWS biologists is the ocelot (*Felis pardalis*), an endangered cat whose numbers have dwindled to fewer than 100 in the U.S. The Mid-Delta Thorn Forest, a biotic community that once covered much of the delta, is a hunting ground for this nocturnal species. Texas ebony (*Pithecellobium ebano*), granjeno (*Celtis pallida*), and colima (*Zanthoxylum*



**Chachalaca (*Ortalis vetula*)**

Photo by Larry Ditto<sup>®</sup>

*fagara*) are but a few of the trees and shrubs that house an array of small mammals and birds, prey for the ocelot. Typified in remnant strips along fence rows, canals, and ditch banks, the diminished thorn forest habitat forces the solitary ocelot to cross open fields and risk the dangers of vehicular traffic and predators, such as dogs. FWS biologists question the genetic viability of the remaining U.S. ocelot population and its ability to survive in a fragmented, diminishing habitat rarely found in tracts larger than 100 acres (40 ha).





**Ocelot**

Photo by Dick Dickenson

Before dams and control structures significantly reduced the flow of the Rio Grande, periodic floods cut shifting channels into the delta creating crescent-shaped oxbows, referred to in the Valley as "resacas." Resacas, complemented by dense bottomland hardwood forests, are characteristic of the Mid-Valley Riparian Woodlands biotic community. This habitat is particularly favored by birds such as chachalacas (*Ortalis vetula*) and green jays (*Cyanocorax yncas*), as well as another endangered and elusive cat, the jaguarundi (*Felis yagouaroundi cacomilti*). Draping Spanish moss (*Tillandsia usneoides*) and another epiphytic bromeliad, the rare Bailey's ball moss (*Tillandsia baileyi*), cling to cedar elm (*Ulmus crassifolia*) and Texas ebony. Found throughout the delta, brush-bordered resacas typical of this community attract many of the neotropical migrants and waterfowl that funnel through the valley on their way to and from Central and South America.

On the edge of the riparian woodlands is a unique and severely diminished biotic community of sabal palms

(*Sabal texana*). Originally occurring over 40,000 acres (16,200 ha), the remaining palms are restricted to about 50 acres (20 ha). They comprise one of the few strongholds for one of the rarest snakes in the U.S., the speckled racer (*Drymobius margaritiferus margaritiferus*). The southern yellow bat (*Lasiurus ega*), a rare, year-round resident, roosts within the fronds of the remaining sabal palms that grow along the southernmost bend of the Rio Grande. The more than 900 species of beetles found within this small grove represents only a fraction of the insect community that aids plant pollination and other essential ecological functions.

The Woodland Potholes and Basins community contains numerous freshwater playa lakes and three hyper-saline lakes. Deep ruts, remnant tracks of oxcarts used by Spanish colonists to haul mined salt, can still be seen at the 530-acre (215-ha) salt lake, La Sal del Rey or "the King's Salt." Black-necked stilts (*Himantopus mexicanus*), black skimmers (*Rynchops niger*), and least and gull-billed terns (*Sterna antillarum* and *Sterna nilotica*, respectively) can be found nesting along the shorelines of the salt lakes. The salty waters support brine shrimp and a few species of salt-tolerant water insects. Set in low woodlands of honey mesquite (*Prosopis juliflora*), prickly pear (*Opuntia* spp.), and lote bush (*Ziziphus obtusifolia*), the freshwater potholes and playa lakes serve as favorite roosting and feeding areas for migrating geese, waterfowl, shorebirds, and sandhill cranes (*Grus canadensis*). Vegetated corridors will eventually connect this tract to the river.

These and the remaining biotic communities emerged from the combination of four climatic zones (subtropical, northern temperate, western desert, and coastal), two major migratory flyways (the Mississippi and the Central), and a diverse soil composition caused by the historical flooding of the Rio Grande. Thousands of years of naturally





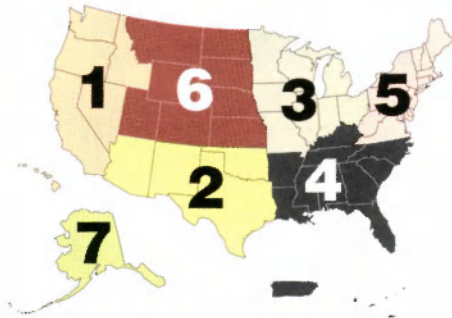
**The Rio Grande**  
Photo by Larry Ditto®

occurring changes have created species-specific relations found only in portions of the lower Rio Grande delta. In the last 150 years, extensive clearing of brush and the drastically curtailed flow of the Rio Grande have seriously impacted these unique systems. To date, there are 86 State- and federally-listed threatened or endangered species in this region.

Through intensive cooperation, management, and education, the Lower Rio Grande Valley NWR hopes to restore, preserve, and connect these diminishing habitats. The remaining 54,000 acres (21,850 ha) necessary to

complete the refuge will be protected through conservation easements or purchased from willing sellers. Currently, offers from landowners interested in selling their property for inclusion in the refuge exceed the available funds. This unique conservation effort gives hope that future generations will have the opportunity to appreciate South Texas' amazing natural resources.

*Nancy Brown is a Public Outreach Specialist with the Santa Ana and Lower Rio Grande Valley NWRs, and is located in Alamo, Texas.*



Regional endangered species staffers have provided the following news briefs:

## Region 1

**Vernal Pool Fairy Shrimp (*Branchinecta lynchi*)** Vernal pool invertebrate surveys funded by the U.S. Fish and Wildlife Service's (FWS) Oregon State Office have revealed the presence of this threatened crustacean within several pools in the Agate Desert near Medford, Oregon. One of four vernal pool invertebrates listed in 1994, this animal has a relatively wide distribution in California vernal pools. Prior to this discovery, its northernmost known location was south of Mount Shasta, California, 80 miles (128 kilometers) south of the Agate Desert area. Vernal pools in the Agate Desert area have been recognized as a rare and imminently threatened natural community type. The FWS is cooperating with a number of Federal, State, county, city, and private stakeholders in an effort to develop a vernal pool conservation plan for the Agate Desert area.

**Lahontan National Fish Hatchery Complex** Fisheries began operation of the new fish lock at the Marble Bluff Fish Facility in Nevada during the second week in April. Although the modification to the facility is not complete, the lock can be operated manually. The lock enables the passage of at least five times the former number of fish during one set and the fish are never lifted out of the water. Therefore, both capacity and the condition of the fish that are captured have greatly improved. Over 100,000 cui-ui (*Chasmistes cujus*), an endangered fish, have been assisted upstream of Marble Bluff Dam to spawning habitat in the lower Truckee River.

There were 4 to 5 weeks remaining in the migration season as this edition of the *Bulletin* was being

prepared, so another large migration season is anticipated. This year will not provide a full test of the potential for the new fish lock because the impacts caused by a flood of 1997 have not yet been resolved. By 1999, the facility's capacity will be tested under optimum design conditions.



**Double-crested cormorant**

Photo by B. Moose Peterson/WRP®

**Salton Sea** Susan Saul, acting Chief of Public Affairs for FWS Region 1, assisted staff at the Salton Sea National Wildlife Refuge (NWR), California, in hosting a media tour to Mullet Island, site of the recent death of 6,000 double-crested cormorant (*Phalacrocorax auritus*) chicks, on May 6. Newcastle disease is the suspected cause of the cormorant deaths. News media interest in the fish and wildlife die-offs at Salton Sea remains strong. Although this species is not endangered, the endangered brown pelican (*Pelecanus occidentalis*) is also found at the Salton Sea.

Reported by LaRee Brosseau of the FWS Portland Regional Office.

## Region 2

**Whooping Crane (*Grus americana*)** The well-known whooping crane flock that migrates between the U.S. and Canada is growing four percent annually and is expected to exceed 200 by the fall of 1999.

Another 98 whooping cranes are now in captivity, mostly in the three breeding centers at the Patuxent Wildlife Research Center in Laurel, Maryland; the

International Crane Foundation in Baraboo, Wisconsin; and the Calgary Zoo in Canada. With captive production growing enough to support reintroduction efforts, removal of the second egg from nests (to promote double-clutching) in Canada was discontinued in 1997 after nearly 30 years. This winter, one set of twin chicks arrived at Aransas NWR, the first twins that have arrived since 1964. Twinning in the Aransas/Wood Buffalo flock has averaged 14 percent of the young.

Beginning in 1993, whooping cranes raised in captivity have been soft-released in the Kissimmee (Kissim'-ee) Prairie region of central Florida. Although bobcats took many of the birds shortly after release and continue to be a major predator, changes in release location and methods have led to 70 percent survival of released birds. The Florida whooping cranes are just reaching breeding age, with four pairs exhibiting nesting behavior. No egg production has been seen yet. Currently 70 whooping cranes are in Florida.

The recovery plan calls for three separate breeding flocks totaling 90 pairs before this endangered species can be reclassified as threatened. Studies are now under way to pick the best location for another migratory population. Proposed sites include the Interlakes area of Manitoba and either the Marsh Island Refuge in Louisiana or Chassahowitzka NWR in Florida. This selection should be made sometime this summer, with proposed reintroduction efforts starting after the year 2000.



**Whooping cranes**

Photo by Richard Beeckman

**Northern Aplomado Falcon (*Falco femoralis septentrionalis*)** The historic range of the northern aplomado falcon in the United States includes southeastern Arizona, southern New Mexico, and southwest Texas. Common in the United States in the early



1900's, the aplomado falcon disappeared from most of its range by 1940; the last verified nesting of native aplomado falcons occurred in New Mexico in 1952. The FWS listed the northern aplomado falcon as endangered in 1986, and the Arizona Game and Fish Department listed it under State law in 1988.



**Young aplomado falcon**  
Peregrine Fund photo

Aplomado falcons are predators of small birds in grasslands and savannahs. Their decline in the U.S. is largely attributed to habitat deterioration due to brush encroachment in grasslands, possibly exacerbated by overgrazing. Pesticide use associated with expanding agricultural development in the southwest also aggravated the aplomado falcon decline in the late 1940's and early 1950's. A recent study by the FWS Arizona Ecological Services Field Office focused on the recovery plan's goal to monitor and evaluate contamination in aplomado falcon potential prey items and made recommendations as to the most suitable areas in Arizona for reintroduction.



**Mourning dove, a common prey of aplomados**  
Corel Corp photo

Meadowlarks (*Stumella* spp.), mourning doves (*Zenaida macroura*), lizards (*Cnemidophorus* spp.), and grasshoppers (*Caelifera* sp.) were collected in 1992

as representative samples of the aplomado falcon's prey base. DDE was the only organochlorine compound detected, and concentrations were below those known to adversely affect reproduction even in the most sensitive avian species. No differences in contaminant levels were found among the five areas sampled. Therefore, aplomado falcons theoretically could be reintroduced into any of the five study areas.

## Flat-Tailed Horned Lizard (*Phrynosoma mcallii*)

The western edge of the Sonoran Desert in southeastern California, southwestern Arizona, and adjoining portions of Baja California and Sonora, Mexico is one of the hottest and driest parts of North America. Annual precipitation is often less than 10 centimeters (4 inches) and summer temperatures frequently soar to 43 degrees Centigrade (110 degrees Fahrenheit) or more in this baked landscape of sandy plains, scattered dunes, and sparse, simple vegetation communities dominated by creosote (*Larrea divaricata*), white bursage (*Ambrosia dumosa*), and galleta grass (*Hilaria rigida*). This harsh environment is home to the flat-tailed horned lizard, a small reptile with a flattened body and tail and relatively long spines on its head. It manages to survive in the desert by escaping the heat of day in shallow burrows it digs or that are dug by other lizards or small animals by feeding on harvester ants.

In 1994, memoranda of understanding signed by a number of Federal agencies called for developing and implementing conservation strategies for species heading for listing. Key habitats of the flat-tailed horned lizard remain primarily on Federal lands or lands managed by California Department of Parks and Recreation. Recognizing that conservation of this lizard could possibly be implemented through appropriate management of State and Federal lands, the Bureau of Land Management's California Desert District organized a working group of Federal and State biologists and land managers in late 1994 to begin development of a conservation strategy. After many long and sometimes contentious workgroup sessions, meetings with user groups and conservationists, and with input from a group of herpetologists, a conservation agreement was signed in the summer of 1997. Signatory agencies included FWS Regions 1 and 2, Bureau of Land Management in Arizona and California, Bureau of Reclamation, Marine Corps Air Station-Yuma, El Centro Naval Air Facility, Arizona Game

and Fish Department, and California Department of Parks and Recreation. Based on the obligation of these agencies to implement the conservation strategy, and conservation actions carried out since the species was proposed for listing, the proposal to list the flat-tailed horned lizard was withdrawn on July 15, 1997.

The conservation strategy establishes four management areas in California and one in Arizona, totaling nearly one-half million acres. Management of the areas is designed to ensure long-term viable populations of horned lizards. A research area is also established in California.

*Reported by Larry A. Dunkeson of the FWS Albuquerque Regional Office.*

## Region 4



**Gulf sturgeon**  
USFWS photo

## Gulf Sturgeon (*Acipenser oxyrinchus desotoi*)

Biologists have located additional spawning sites for this threatened fish. Eggs were found in six locations within the Choctawhatchee River system in Florida and Alabama. Previously, only two spawning sites were known, both in the Suwannee River in Florida. Dewayne Fox of the North Carolina Cooperative Fish and Wildlife Research Unit collected 30 adult gulf sturgeon in Choctawhatchee Bay before their upstream migration into fresh water. Male and female fish, weighing from 50 to 170 pounds, were sexed and equipped with internal or external radio and sonic tags. Egg samplers were deployed in areas that tagged fish frequent. Habitats at all spawning sites consisted of rivers with limestone bluffs or outcroppings of hard substrates. This information will be valuable in locating other sites.

*Reported by Lorna Patrick of the FWS Panama City, Florida, Field Office.*

During February–April 1998, the Fish and Wildlife Service published the following proposed and final listing actions in the *Federal Register*:

## Listing Proposals

### Santa Cruz Tarplant (*Holocarpha macradenia*)

An aromatic annual herb in the sunflower family (Asteraceae), this plant grows to about 20 inches (50 centimeters) in height and displays heads of yellow flowers in summer. It grows on coastal terrace prairies in central California from Marin County south to Santa Cruz County. Urban and commercial development, habitat alteration resulting from livestock grazing, and competition from non-native plants have reduced the species to only 18 populations. On March 30, the FWS proposed to list the Santa Cruz tarplant as threatened.

### Purple Amole (*Chlorogalum purpureum*)

Another plant found only in California's central coast region, the purple amole occurs at a few sites in Monterey and San Luis Obispo Counties. It is a bulb-forming perennial in the lily family (Liliaceae) that has blue flowers and narrow leaves with wavy edges. Amoles are often called "soap plants" because of the soapy lather that can be produced from their bulbs. The purple amole is comprised of two varieties. *C. p. var. purpureum*, which occurs at sites on Fort Hunter Liggett, is threatened by habitat modification resulting from the construction and use of military training facilities, certain field training activities, and alteration of natural fire cycles. The other variety, *C. p. var. reductum*, known only from two sites on a national forest and private land, is threatened by illegal vehicle trespass onto the U.S. Forest Service population. Due to its vulnerability and limited range, the purple amole (including both varieties) was proposed on March 30 for listing as a threatened species.

**Four Coastal California Plants** In a separate March 30 action, the FWS proposed to list four plants native to the south-central coastal region of California as endangered:

- La Graciosa thistle (*Cirsium loncholepis*)—a short-lived (1–2 years), spiny, 40-inch (1-meter) tall species in the sunflower family with purple and white flowers. Nine populations are known to exist, all on private lands and most of which are within active oil production fields.
- Lompoc yerba santa (*Eriodictyon capitatum*)—a lavender-flowered shrub in the waterleaf family (Hydrophyllaceae) that can grow up to 10 feet (3 m) tall. Two of the four known populations of this plant

are on Vandenberg Air Force Base, one is in an active oil field, and one is on private land.

- Gaviota tarplant (*Hemizonia increscens* ssp. *villosa*)—a yellow-flowered annual in the sunflower family that grows up to 3 feet (0.9 m) tall. The single known population is located on a small coast terrace adjacent to a petroleum industry facility.
- Nipomo Mesa lupine (*Lupinus nipomensis*)—an 8-inch (20-centimeter) annual in the pea family (Fabaceae) with pink-petaled flowers. About 700 plants are found in a small area of coastal backdune habitat close to a petroleum refinery.

These species occur only in southern San Luis Obispo County and the northern and western portions of Santa Barbara County. All four plants are believed to be in danger of extinction due to residential, commercial, and petroleum development; alterations of natural fire cycles; and invasions of non-native plants.

**Yreka Phlox (*Phlox hirsuta*)** A perennial in the family Polemoniaceae, the Yreka phlox grows to about 6 inches (15 cm) from a stout, woody base. It is covered with hairs, as indicated by its scientific name, and produces pink and purple flowers. The two known populations grow only on serpentine slopes in Siskiyou County. One population occurs on lands owned by the city of Yreka and the other is found on property of mixed ownership. Because development within this restricted range threatens the Yreka phlox with extinction, the FWS proposed on April 1 to list the species as endangered.



Yreka phlox

Photo by Diane Elam

**Kneeland Prairie Penny-cress (*Thlaspi californicum*)** Another California plant endemic to serpentine outcrops, this species is known from a single population found on the Kneeland Prairie in Humboldt County. It is a perennial herb in the mustard family (Brassicaceae) that grows to about 6 inches in height from a basal rosette and produces white flowers. Because this

species has such a restricted range, it is vulnerable to habitat loss resulting from potential road alignment work and proposed airport expansion activities. On February 12, the FWS proposed to list the Kneeland Prairie penny-cress as endangered.

**Gentner's Fritillary (*Fritillaria gentneri*)** A plant in the lily family, Gentner's fritillary grows from a fleshy bulb and produces showy red, bell-shaped flowers highlighted with pale yellow streaks. Only 340 individual plants are known to exist, all growing at scattered sites in the rural foothills of the Rogue and Illinois River valleys in Josephine and Jackson counties, Oregon. The land ownership is a mix of Federal, State, municipal, and private property. Gentner's fritillary is threatened by residential development, certain agricultural and silvicultural activities, road construction and maintenance, horticultural collecting, and off-road vehicles. On March 23, the FWS proposed to list this wildflower as endangered.

**Chiricahua Dock (*Rumex orthoneurus*)** A rare southwestern plant, the Chiricahua dock is a herbaceous perennial in the buckwheat family (Polygonaceae) that grows to about 40 inches (1 m) in height. It occurs in streamside and wetland habitats in eastern Arizona, northern and western New Mexico, and a site in northern Mexico. In the United States, it is found exclusively on Federal lands in the Chiricahua, Pinaleno, Huachuca, Sierra Ancha, and White Mountains in Arizona, and in the Mogollon Mountains and Pecos Wilderness of the Gila and Santa Fe National Forests in New Mexico. Degradation and loss of wetland and riparian habitats due to livestock grazing, recreation, logging, mining, water diversions and development, road construction and maintenance, and wildfire have reduced the species' range and numbers. Continuing threats to sensitive habitats led the FWS to propose listing the Chiricahua dock as threatened in the April 1 *Federal Register*.

**Pecos Sunflower (*Helianthus paradoxus*)** A large, showy plant, the Pecos wildflower grows in desert wetlands in New Mexico and Texas. It looks much like the common sunflower seen along roadsides through the West, but this species is found in only five areas. In New Mexico, the Pecos sunflower occurs near the town of Grants, along the lower Rio San Jose, around the town of Santo Rosa, and near the Pecos River from just north of Roswell to near Dexter. In Texas, it grows only near Fort Stockton. The loss of wetland habitat due to groundwater pumping, water diversions, wetland filling, and the growth of non-native



saltcedar is the main threat to the Pecos sunflower. It was proposed on April 1 for listing as threatened.

**Colorado Butterfly Plant (*Gaura neomexicana* ssp. *coloradensis*)** This subspecies, a short-lived perennial herb in the family Onagraceae, produces one or a few reddish, pubescent stems up to about 3 feet (80 cm) in height with white flowers that turn pink or red with age. It grows in moist areas of floodplains within a small area of southeastern Wyoming, western Nebraska, and north-central Colorado. Currently, only 22 populations, with a total of fewer than 26,000 individuals, remain, and most are on privately-owned land. Indiscriminate herbicide spraying, haying and mowing at certain times of the year, some water development, land conversion for cultivation, competition from non-native plants, and urbanization are the main threats to the plant. On March 24, the FWS proposed to list the Colorado butterfly plant as threatened.

**Cowhead Lake Tui Chub (*Gila bicolor vaccaceps*)** Known only from the vicinity of Cowhead Lake in the northeastern corner of California, this small native fish is in danger of extinction due to habitat loss. Historically, the shallow Cowhead Lake dried up on occasion, confining its endemic tui chub to the adjacent springs and streams that fed the lake. Over the past 50 years, however, a series of irrigation ditches, two dams, and a mechanical pumping system have converted the lake from a 2,700-acre (1,100-hectare) marsh to an irrigated pasture. As a result, the Cowhead Lake tui chub has lost 98 percent of its historical range, and the entire population is now restricted to 3.4 miles (5.4 kilometers) of Cowhead Slough and connected ditches within the lakebed. About half of the remaining range is privately managed, with the other half administered by the Bureau of Land Management. The tui chub's survival is vulnerable to any additional agricultural, grazing, and water removal activities that could damage the last two percent of its habitat. To give this fish protection, the FWS proposed on March 30 to list it as endangered.

**Devils River Minnow (*Dionda diaboli*)** Named for the Devils River in west Texas, this small fish is native to several Rio Grande tributaries. Currently, it is restricted to three stream systems in Verde and Val Verde counties, Texas, and one drainage in Coahuila, Mexico. Over the past 25 years, the Devils River minnow has declined from one of the most abundant fish in the area to one of the least abundant. Its reduced numbers and distribution may be attributed in large part to the effects of habitat

loss, modification, and fragmentation and possibly to predation by introduced smallmouth bass (*Micropterus dolomieu*). The Devils River minnow is already listed by the State of Texas as threatened, although this designation does not give the species' habitat legal protection. On March 27, the FWS proposed to list the minnow as endangered under the Federal ESA.

**Northern Idaho Ground Squirrel (*Spermophilus brunneus brunneus*)** This rare squirrel has one of the smallest ranges of all North American mainland mammals. Currently, it is found only within an 18-by-20-mile area northwest of Council, Idaho, although its former range may have been much larger. Fewer than 1,000 individuals were found during 1997 surveys, primarily on private lands and Payette National Forest. The northern Idaho ground squirrel lives in dry, rocky meadows surrounded by ponderosa pine or Douglas-fir forests. Loss of meadow habitat due to forest encroachment, the result of fire suppression, is the main threat to the ground squirrel. Other dangers include the conversion of meadows to agricultural fields, residential development, competition from the larger Columbian ground squirrel (*Spermophilus columbianus*), and recreational shooting of squirrels in colonies near towns and farms. On March 23, the northern Idaho ground squirrel was proposed for listing as threatened. Efforts to conserve this subspecies may involve tree thinning and prescribed burning of shrubby vegetation on Payette National Forest.



Photo by Rich Howard/USFWS Snake River Basin Office

## Final Listing Rules

**Pallid Manzanita (*Arctostaphylos pallida*)** A rare, woody shrub in the heath family (Ericaceae), the pallid manzanita grows to as tall as 13 feet (4 m) and produces

white, urn-shaped flowers. It is found only in Alameda and Contra Costa counties, California. The main threats to this species are shading and competition from native and non-native plants, fire suppression (which allows the encroachment of competing plants), herbicide spraying, disease, and habitat fragmentation. On April 22, the FWS listed the pallid manzanita as threatened.

**Peninsular Bighorn Sheep (*Ovis canadensis*)** A distinct population segment of the bighorn sheep that is restricted to the Peninsular Ranges of southern California was listed March 18 as endangered. The synergistic effects of habitat loss, degradation, and fragmentation; disease; low recruitment; human-related disturbance; and high predation rates threaten the survival of this mammal in southern California. New information gained during the public comment period led the FWS to conclude that listing the bighorn populations in Baja California, Mexico, is not needed, and therefore it was not included in the final rule.



Peninsular bighorn sheep

Photo by B. Moose Peterson/WRP

**Seven Southeastern Mussels** On March 16, the FWS published a final rule giving ESA protection to seven freshwater mussel species from Alabama, Georgia, and Florida. The five species in greatest danger were listed as endangered:

- fat threeridge (*Amblema neislerii*),
- shinyrayed pocketbook (*Lampsilis subangulata*),
- Gulf moccasinshell (*Medionidus penicillatus*),
- Ochlockonee moccasinshell (*Medionidus simpsonianus*), and
- oval pigtoe (*Pleurobema pyriforme*).














Because the other two species are in less immediate danger, they were listed as threatened:

- Chipola slabshell (*Elliptio chipolaensis*) and
- purple bankclimber (*Elliptoideus sloatianus*).

These 7 mussels have decreased due to habitat loss associated with reservoir construction, channel construction and maintenance, and erosion.

# BOX SCORE

Listings and Recovery Plans as of June 30, 1998

GROUP	ENDANGERED		THREATENED		TOTAL LISTINGS	U.S. SPECIES W/ PLANS*
	U.S.	FOREIGN	U.S.	FOREIGN		
 MAMMALS	59	251	8	16	334	43
 BIRDS	75	178	15	6	274	77
 REPTILES	14	66	20	14	114	30
 AMPHIBIANS	9	8	7	1	25	11
 FISHES	68	11	39	0	118	79
 SNAILS	15	1	7	0	23	19
 CLAMS	61	2	8	0	71	45
 CRUSTACEANS	16	0	3	0	19	7
 INSECTS	28	4	9	0	41	21
 ARACHNIDS	5	0	0	0	5	4
ANIMAL SUBTOTAL	350	521	116	37	1,024	336
 FLOWERING PLANTS	525	1	114	0	640	408
 CONIFERS	2	0	0	2	4	1
 FERNS AND OTHERS	26	0	2	0	28	26
PLANT SUBTOTAL	553	1	116	2	672	435
GRAND TOTAL	903	522	232	39	1,696*	771

TOTAL U.S. ENDANGERED: 903 (350 animals, 553 plants)  
 TOTAL U.S. THREATENED: 232 (116 animals, 116 plants)  
 TOTAL U.S. LISTED: 1135 (466 animals\*\*\*, 669 plants)

\*Separate populations of a species listed both as Endangered and Threatened are tallied once, for the endangered population only. Those species are the argali, chimpanzee, leopard, Stellar sea lion, gray wolf, piping plover, roseate tern, green sea turtle, saltwater crocodile, and olive ridley sea turtle. For the

purposes of the Endangered Species Act, the term "species" can mean a species, subspecies, or distinct vertebrate population. Several entries also represent entire genera or even families.

\*\*There are 488 approved recovery plans. Some recovery plans cover more than one species, and a few species have separate plans covering different parts of their ranges. Recovery plans are drawn up only for listed species that occur in the United States.

\*\*\*Five animal species have dual status in the U.S.

**ENDANGERED**  
*Species*  
**BULLETIN**

*U.S. Department of the Interior  
 Fish and Wildlife Service  
 Washington, D.C. 20240*

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